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THE RELATION OF ULTRA-VIOLET LIGHT TO NUTRITION*

BY HARRIETTE CHICK, D.Sc. LOND.
OF THE DIVISION OF NUTRITION, THE LISTER INSTITUTE, LONDON

LECTURE II

Influence of Vitamin D on Mineral Metabolism

THERE is thus abundant proof that vitamin D, whether supplied ready made as cod-liver oil or as irradiated ergosterol, or made in the animal by direct irradiation, is the dominant factor regulating the metabolism of calcium and phosphorus in the body. A lowered phosphorus content of the blood is often, but not always, found in animals and children suffering from rickets.[56 57] Hess and Lundagen [58] showed that there was a seasonal tide in the level of blood phosphorus in infants, reaching a minimum in spring and a maximum in summer, which was in inverse relation to the seasonal incidence of rickets. In cases of infantile rickets which are complicated by tetany there is an abnormally low concentration of blood calcium (see Howland and Marriott [59]). Experimental rickets has been produced of both types [60] —i.e., showing respectively low blood phosphorus or low blood calcium—(see also Park,[61] pp. 134–139, for a review of the earlier work on this subject).

The effect of vitamin D therapy, however applied, is to raise slowly the level of calcium or phosphorus in the blood where these are subnormal [61 62 63] but, since the action of these antirachitic agents also causes increased deposition of these elements in the bones, there may be the risk of an initial temporary lowering of the blood calcium, to be avoided in case of tetany, where this may already be at a dangerously low level. For this reason many authors hold that extra calcium salts should be given in the initial stages of antirachitic therapy. Huldschinsky [64] described the development of tetanic convulsions in rachitic children shortly after the first exposure to ultra-violet radiation.

In some of the earliest studies on calcium metabolism it was shown that administration of cod-liver oil caused an improved calcium retention in rachitic children. Schabad, for example, in 1910, anticipated the results of Mellanby's experimental work when he showed that cod-liver oil therapy caused a large positive increase in the balance of both calcium and phosphorus in two rachitic children, while negative results followed administration of sesame oil.[65] A similar improvement was later shown to follow treatment of rickets with ultra-violet light; [66] in this instance the much lessened fæcal and relatively increased urinary excretion of calcium suggested that the antirachitic action of the radiation might be due, in part at least, to an increased absorption of calcium and phosphorus from the alimentary tract.

In the researches on osteomalacia of Maxwell and his colleagues,[25] abnormally low blood calcium and phosphorus and a negative calcium balance was found to be a feature of severe cases. The previous diet was analysed and found to be deficient in calcium. Treatment with cod-liver oil, with or without calcium lactate, caused a change to a positive calcium balance in three severe cases within a week and there was a rise of blood calcium and blood phosphorus. When olive oil was given with additional calcium lactate, no such changes occurred.[25]

In recent years much attention has been directed to the effect of irradiation and other forms of vitamin D therapy upon the mineral metabolism of lactating animals, which frequently show a negative calcium equilibrium owing to the excessive drain caused by milk production. Hart and Steenbock and their colleagues in Wisconsin [68] demonstrated a favourable change in the calcium retention of milking goats after regular irradiation with a mercury-vapour lamp, but were unable to demonstrate any such benefit after this treatment in "full milking" cows, though positive calcium balances were observed in these also in early autumn after several months' exposure to the summer sunshine.[69 70] Researches at the Rowett Institute by Orr, Henderson, and others [71 72] gave similar results. The loss of calcium from the bodies of lactating goats was diminished when the animals, kept indoors without change of ration, were irradiated daily with a carbon arc lamp. There was a marked fall in the fæcal calcium accompanied in some cases by a rise in the urinary calcium, indicating an increased absorption of calcium under the influence of ultra-violet irradiation. Similar results were obtained with pigs, in which the mineral retention had been artificially lowered by feeding a ration with an unfavourable mineral supply.[73]

Additional evidence that vitamin D, whether supplied by irradiation or by ingestion of cod-liver oil, may favour the absorption of calcium salts from the intestinal tract is provided by the fact that, in dogs and rats receiving a rachitogenic diet, a change in reaction of the fæces takes place from slight acidity to slight alkalinity, which is reversed when antirachitic therapy of either type is given.[74 75] In dogs these changes were located in the intestines by Grayzel and Miller [76] and appeared to be analogous with the lowered gastric acidity observed in infantile tetany [77] and the temporary improvement of symptoms observed after administering remedies of an acidic nature.[78]

Since rickets and tetany occur in infants receiving abundant supplies of calcium and phosphorus in their food, as for example in cow's milk, the defect in metabolism must lie in failure to absorb, or in failure to retain, these salts or in both. There is evidence, however, which suggests that the diets of older children and of adults may frequently contain a suboptimal provision of calcium (see below). In these cases the action of vitamin D may be supposed to increase absorption and induce economic utilisation of the available supply. Much of the experimental work on rickets has been carried out on animals, e.g., rats, which are not very susceptible to lack of vitamin D and to induce rickets it has usually been found necessary to arrange an unfavourable provision of calcium and phosphorus in the diets given. With such animals vitamin D, whether given as cod-liver oil or as irradiation, seems to effect a more economical use of the available minerals and to secure a sufficiency for the growing bones, even at the expense of other tissues. The animal may not show normal growth, but the bones will be well calcified.

In Table III. figures are given showing the effect on the composition of the leg bones of rats of making antirachitic additions of varying potency (cod-liver oil and specimens of milk and butter rich and poor respectively in vitamin D) to a rachitogenic diet low in phosphorus. The results show a regular increase, in proportion to the potency of the antirachitic supplement, in the percentage of ash contained in the bones and in the value of the A/R ratio. This ratio, of the

* The second Oliver-Sharpey lecture for 1932, delivered before the Royal College of Physicians of London on May 5th. Lecture I. appeared last week.

ash content of the bones to the organic matter present other than fat, is a measure of the proportion of calcified to uncalcified bone, and has been found to give a useful indication of the degree of rickets.

TABLE III.—*Antirachitic Action of Vitamin D, administered as milk, butter, or cod-liver oil*

(Tested on rats receiving McCollum's rachitogenic diet No. 3143 for 28 days. Chick, Korenchevsky, and Roscoe, 1926 [78]).

Supplement to diet.		Analysis of leg bones (dry, fat-extracted).			Rickets (histology rib-junctions).
—	Daily dose.	% Ca.	% ash.	A/R ratio.	
None	—	12·0	32·4	0·47	Severe.
Butter I*..	0·6 g.	13·9	37·6	0·57	Moderate.
,, II.†..	0·6 g.	18·0	48·9	0·89	Very slight.
Milk II. ..	5 c.cm.	16·7	45·3	0·74	"None."
Cod-liver oil	0·05 g.	18·7	50·7	0·96	

* Cow kept in a dark stall, fed on fresh cut grass.
† Cow on pasture in summer.

The discovery of MacCallum and Voegtlin in 1909 [80] that tetany followed removal of the parathyroid glands has been succeeded by an accumulation of evidence, both experimental and clinical, showing the influence of the parathyroid secretion in regulating the metabolism of calcium and phosphorus in the organism. Thus Erdheim in 1914 [81] described pathological changes in the histology of the parathyroids obtained from human cases of rickets and osteomalacia, and from rats in which rickets had been induced experimentally. Luce [82] showed that hyperplasia of the parathyroid glands in rats was associated with diets low in calcium. Collip's parathormone, when injected, has been found to act specifically in curing tetany by speedily raising the calcium content of the blood to the normal level and, if given in excess, to produce a hypercalcæmia which may lead to death (see Collip, 1926). In this case the increased calcium in the blood is obtained by removal from the bones and soft tissues, and not by an increased absorption from the food; Stewart and Percival [84] found that the action of the parathormone in raising the level of the blood calcium in cats was not interfered with by removal of the intestinal tract below the œsophagus.

Vitamin D though causing similar changes in the mineral content of the blood appears to act in a manner opposed to that of parathormone. As shown above (see Table III.) its action consists in increasing the absorption of calcium and phosphorus from the intestines and in incorporating these elements in the bones. When given in excess, however, as in the administration of large doses of irradiated ergosterol, this action appears to be reversed and the resulting hypercalcæmia to be caused not by increased absorption from the food, but by removal from the bones. Hypercalcæmia has been shown to occur in rats under these conditions, even when the diet contained only minimal amounts of calcium or was entirely free from it.[85 86] Although the evidence on this subject is somewhat contradictory, the most recent work indicates that the action of excessive doses of vitamin D takes place through the intermediary of the parathyroids.[87] In hypervitaminosis D, as the condition has been termed, there is usually a greatly increased excretion of calcium and phosphorus, with pathological deposition of calcium in many tissues, especially in the arteries and kidneys and, if the condition is severe, death ensues.

The difference between therapeutic and toxic doses of vitamin D is however very great, and to obtain these pathological results in experimental animals many thousand times the usual dose is required.[88] The nature of the experimental diet, especially as regards the calcium content, seems also to be an important factor, and some observers have failed to obtain toxic effects even with excessive doses of irradiated ergosterol.[89]

There are but few instances of toxic effects on children after administration of vitamin D in large doses, and in all those reported the vitamin has been given as irradiated ergosterol and of this relatively very large doses seem to be necessary. J. H. Hess and others [90] gave 50 times the prophylactic dose over a long period without ill-effects, but cases have been reported from Germany in which children have suffered and even died from overdosage.[91]

Irradiated ergosterol is so powerful a drug and the ordinary dose for an infant so small (0·1 to 0·5 mg., see Hess and Lewis [92]) that it is clearly desirable that all therapeutic preparations should be accurately standardised before use. The international standard and unit for vitamin D,[93] adopted at the International (League of Nations) Conference on Vitamin Standards, 1931, will enable comparable biological tests of such preparations to be carried out in all countries and should secure the needed control of all such commercial therapeutic products.

Other Effects of Irradiation on the Organism

Evidence is most contradictory regarding the existence of any specific effects of irradiation, which might be related to nutrition, other than that on the mineral metabolism. D. T. Harris [94] described experiments showing effects of ultra-violet radiation in stimulating the gaseous metabolism of rats and to this action he found visible light rays to be antagonistic, but his observations lack confirmation.

The observed good effects of open-air treatment on certain forms of tuberculosis and other diseases have been attributed to specific action of ultra-violet light on metabolism, but many of the observations lack scientific precision or objective criteria for comparison, and the basis of this form of therapy must be regarded as mostly empirical at the present time.[95] Among the researches, however, in which efforts have been made to analyse the various factors involved, are the large series of clinical investigations emanating from the school of Kestner at Hamburg. Kestner and his colleagues [96 97 98] have adduced evidence to show that the raised oxygen consumption of healthy persons at high altitudes and the increased nitrogen retention and accelerated regeneration of red blood-cells and rise in hæmoglobin content of the blood, observed in ailing children in seaside or mountain sanatoria, are attributable, in part at least, to the increased exposure to sunlight.[99 99A] Beneficial effects of ultra-violet irradiation on regeneration of hæmoglobin have also been reported with various forms of secondary anæmia produced experimentally.[100 100A]

A series of well-controlled observations on young infants by Mackay,[101] however, gave results directly opposed to these views. Among over 200 infants under 2 years of age, observed as out-patients in a London hospital, no favourable effect on the hæmoglobin content of the blood was detected in those receiving regular ultra-violet irradiation from a mercury-vapour quartz lamp during the winter months, as compared with the control children receiving no such treatment. Both groups were ordered cod-liver oil to ensure a sufficient supply of vitamin D. No advantage was observed in the irradiated children as regards any improved gain in

weight, in mental or physical progress, or in increased resistance to infection. Similar results were obtained by Colebrook.[102]

A series of experimental and clinical researches by Clark and her colleagues in Baltimore have failed to discover any influence of ultra-violet irradiation in raising the resistance of the irradiated organism to infective agents. These researches included observations on experimental infection of rats with pneumococcus,[103] and of chickens with fowl-cholera,[104] and on the effect of local irradiation of abscesses in rabbits caused by *Bacillus lepisepticus*.[105] In an observation on 363 student volunteers at the Johns Hopkins University no enhanced resistance to the common cold or to more serious respiratory infections could be detected among the group receiving systematic irradiation with the ultra-violet rays from a mercury arc quartz lamp throughout the winter, as compared with a control group receiving no irradiation.[106]

As a matter of fact, some of the well-established effects of ultra-violet irradiation must rather be regarded as themselves pathological in character, as for example the effect in causing skin erythema and pigmentation. There is evidence that the last may be a protective mechanism against further damage. The observation that "good pigmenters do better" when undergoing sun treatment, may be due to the fact that such patients are able to enjoy the generally stimulating effects of the régime without the drawbacks—the discomfort, restlessness, and sleeplessness—which may follow overdosage with ultra-violet rays.

The proved effects of ultra-violet irradiation on the calcium and phosphorus metabolism may, however, be so far-reaching as to affect every department of the living economy. Although the bones and teeth contain most of these elements, every tissue in the body needs a sufficiency of both calcium and phosphorus for its correct functioning and if, from any cause, the correct utilisation of these minerals is disorganised, it is clear that the whole organism will suffer. This is especially true at those times in life when the need for these minerals is greatest, as, for example, when extra supplies are required to support the growth of the bony tissues in children or to bear the strain of pregnancy or lactation in women.

The Antirachitic Radiations of Sunlight

Early in the history of this subject it was found that the effect of irradiation in curing rickets or in creating the antirachitic vitamin from its precursors (Rosenheim and Webster [108]) was prevented if the rays passed through ordinary window glass. This located the active rays among the ultra-violet of wave-length less than 330 mμ and careful experiments with filters carried out by Hess and his colleagues [16 109 110] have fixed the limit at 313 mμ.

On reference to Fig. 2 it will be seen that the active rays (hatched zone) are present only at the extreme limit of the sun's spectrum, rays of wave-length 290 mμ being the shortest which have been detected at the earth's surface in the middle of summer and under conditions of great atmospheric clearness when the sun is at its zenith. From December to February the shortest rays have been given as of wave-length 312 mμ; from March to May as of 301 mμ. The shorter ultra-violet rays coming from the sun are absorbed by the ozone present in the upper reaches of the atmosphere and the limit of those reaching the earth recedes more and more as the radiations reach the earth obliquely. Only a very small amount, a fraction of 1 per cent., of the sun's total energy is contained in the short wave radiations which reach the earth.[11]

FIG. 2

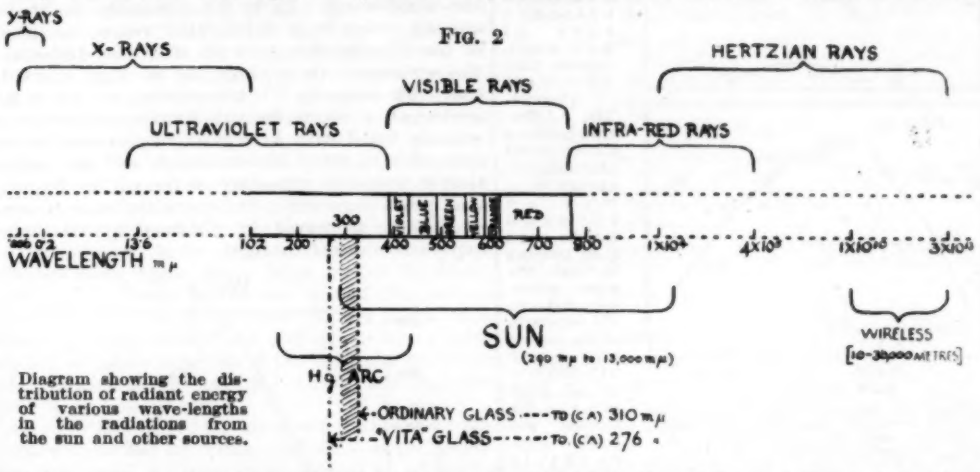


Diagram showing the distribution of radiant energy of various wave-lengths in the radiations from the sun and other sources.

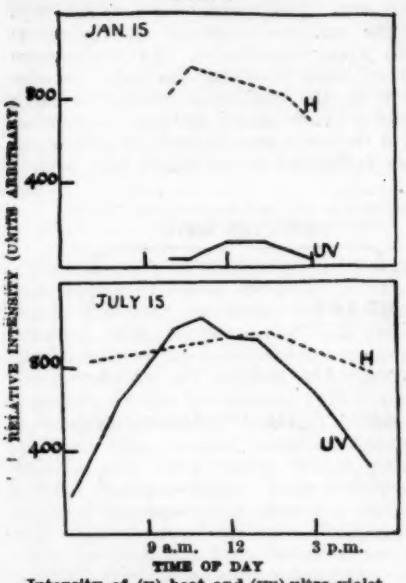
Careful studies of the variation in intensity of the ultra-violet radiation from the sun at different seasons of the year and at different times of the day have been made by Dorno at Davos,[112] by L. Hill and his colleagues at several places in Great Britain and abroad,[113] and by Clark at Baltimore.[114] Dorno's results showed the sun's ultra-violet radiations (measured by a photo-electric cell) at Davos to be minimal in intensity in January as compared with July, and the seasonal variation in intensity from month to month for these rays to be much greater than for visible light (brightness, measured by a photometer) or for the solar heat rays (see Fig. 3). The absorption of the atmosphere is greater for the sun's ultra-violet than for its other radiations, so that the obliquity of the angle with which the rays strike the earth effects the intensity of these radiations at the earth's surface more than that of the "light" or heat rays.

The method used by L. Hill,[114] in which the intensity of the ultra-violet radiations of wave-length from 300–385 mμ is measured by the rate of fading of a standard acetone-methylene-blue solution, has the advantage of a simple technique and with the coöperation of voluntary observers useful comparative records have been kept of the amount of solar ultra-violet radiations in places in Switzerland and Egypt, and in Great Britain, including those for which figures are published in the daily press. One of the most striking results obtained by comparison of the values obtained for monthly averages of various places, is the great effect of the smoky air in industrial areas

in reducing the amount of ultra-violet radiation received. For example, in London the average at Hampstead where the air is relatively free from smoke has frequently been found to be twice that observed at Kingsway and in certain instances 3 to 4 times as great.

Clark [115] devised an original and ingenious method for measuring the intensity of the ultra-violet rays of antirachitic activity. Using as criterion the darkening of a preparation of zinc sulphide, sensitive only to ultra-violet radiations of wave-length shorter than 350 mμ, she measured the effect produced when this material was screened respectively by plates of glass (which absorbed rays of wave-length shorter than 315 mμ) and of quartz. The difference between the total photographic energy transmitted through quartz and that passing through the glass, corresponded to the intensity of the rays of wave-length 315–290 mμ, or of what may be termed the sun's antirachitic radiation.

FIG. 3



Intensity of (H) heat and (UV) ultra-violet radiation received throughout the day in January and July respectively, at Davos, Switzerland (Dorno, 1910 [113]).

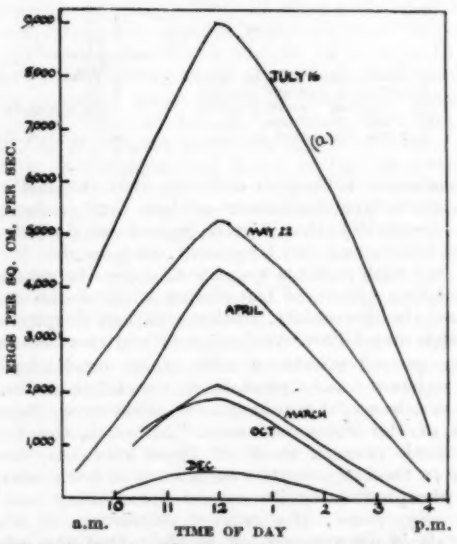
The intensity expressed as ergs per sq. cm. per second was calculated from determination of the times of exposure required to produce a standard degree of darkening by reference to scale calibrated in absolute units of energy.

Clark's results [116] confirm those of Dorno and Hill; they show that the intensity of the sun's antirachitic radiations reaches its maximum in July, that obtained at noon from direct sunshine being about 14 times as great, and that from the north sky about ten times as great, as in December (the intensities expressed as energy being 5800 and 2100 ergs per sq. cm. per sec. in July, as against 400 and 300 respectively in December). The figures showing the diurnal variations are also very significant. In July the average intensity of the antirachitic radiation varied from about 6000 ergs per sq. cm. at noon to 1200 at 4 P.M., in December from 500 to 100 (see Fig. 4).

The above figures are in complete accord with the known facts of the seasonal incidence of rickets and the allied diseases which develop after the dark months of the year. They also provide guidance for making the best use of the sunlight available at the different seasons. In late autumn, winter, and early spring it is only in the period round about noon that the sun's antirachitic rays can be enjoyed to any significant extent, especially in temperate latitudes, and this fact should guide those who have the responsibility of arranging the hours for outdoor exercise for growing children. It is not possible to say how much of such ultra-violet radiation is required for health, for the amount of the antirachitic vitamin obtained from this source will be required to supplement what is contained in the diet and will depend on the amount present therein. It is, however, evident from the common occurrence of rickets and the prevalence of dental disease in our own country, that many of our children, especially those living in industrial centres, do not receive enough exposure to sunshine.

The glazing of windows with special glass transparent to ultra-violet rays has been widely recommended in many quarters. Vita glass is one well-known variety which transmits the ultra-violet radiations contained in sunlight. Clark [117] made a study of the intensity of ultra-violet radiations received in various positions in a room with windows glazed with Vita glass; she concluded that it was more economical, in every sense of the word, to give school-children a short noon-day recess than to install special pervious window glasses. Such an installation would only benefit appreciably those situated in the direct rays of the sun, quite near to the window-sill. It is not generally realised how quickly, even in a well-lighted room, the intensity of the illumination falls off with the distance from the windows. On a clear day in May, Clark found that the intensity of ultra-violet radiation in the centre of a room distant 5 metres from a north window fitted with Vita glass was so small as to be incapable of direct measurement, and she calculated that it would be necessary to remain for 20 hours in that position in order to receive the same amount of irradiation as would be obtained by two minutes' exposure to direct sunlight.

FIG. 4



Diurnal variation in average intensity of antirachitic solar radiation (wave-length 290 to 315 mμ) at Baltimore, in different months in 1929. Curve (a) refers to an especially bright day in July (Clark, 1930 [114]).

While the installation of ultra-violet transmitting glass appears an uneconomical method of securing ultra-violet radiation for persons in schoolrooms, offices, or factories where relatively few are situated near the windows, it should nevertheless prove a valuable measure in the homes of delicate infants, invalids, or old people who, being unable to take exercise, cannot be out of doors in cold weather and are frequently starved of sunlight during the winter months, except for the rays which traverse the window glass of their living rooms.

It may also be desirable to use ultra-violet transmitting glass for skylights in infants' creches or in special hospital departments for sun treatment where it is important in winter to obtain the maximum possible of these radiations throughout the day. Even then it must be remembered that the transparency of most varieties of such glass deteriorates after exposure to light and that the efficiency is also greatly impaired by even slight accumulation of dust or dirt.[118]

Origin of the Antirachitic Vitamin in Nature and Distribution in Foodstuffs

The only methods at present available for studying the distribution of vitamin D in nature and for estimating the amount present in ordinary foodstuffs are biological, and consist in the determination of the minimal amounts which must be added to a standard rachitogenic diet, to prevent or cure rickets, or to effect a certain degree of calcification of the bones, in the experimental animals, usually rats. The result of a vast amount of such work has shown that the antirachitic vitamin is but sparsely distributed in natural foodstuffs, as compared with other vitamins. Egg-yolk and the body and liver oils of certain fishes are the richest known sources; butter and milk are much less potent and contain a variable amount, depending on the season of the year and the diet of the cow. The livers of mammals also contain vitamin D but in much smaller amounts than those of fishes. It is present in some animal fats, and very small quantities have been detected in green vegetables when these have been picked in direct sunlight.[119 120] Green leaves are one of the richest known sources of the fat-soluble vitamin A, and this difference in distribution was one of the chief facts which led to the recognition of the separate existence of the antirachitic vitamin which accompanies vitamin A in many foods.

The action of sunlight on ergosterol is at present the only known method by which vitamin D is created in nature, and there is therefore at present no adequate explanation as to whence the cod and other deep-sea fish derive their rich stores. Since the amount of ultra-violet radiation received by such fishes can only be very small, it has been supposed that the cod derives the vitamin from its food and forms a concentrated depôt in its liver. But attempts to detect vitamin D in the caplin, a small fish on which the cod feeds in summer, or in the copepods which form its diet in the spring, have all given negative results.[121 122] A small marine green diatom, *Nitzschia closterium*, which is very rich in fat-soluble vitamin A and capable of synthesising this vitamin under laboratory conditions, was also found devoid of vitamin D even when cultivated under conditions of exposure to the ultra-violet radiations from the sun.[123]

The antiscorbutic potency of cow's milk has been found greater in summer than in winter (see Table IV.). Attempts to analyse this effect, as regards the seasonal changes in diet of the cow and in the degree of its insolation, have shown that the principal factor in determining the antirachitic value of the milk is the degree of exposure to sunshine.[124 125] A change from a dry winter feed to one of fresh cut green grass had no appreciable effect on the vitamin D content of the milk as long as the cow remained in a dark stall, but the antirachitic value became raised when, without change of diet, the animal was exposed to summer sunshine in a ploughed paddock. But the fact that higher values still were obtained when the cow was on pasture in the summer suggested that some additional vitamin D must have been derived from the green herbage (I., Table IV.). The antirachitic value of cow's milk has been raised in winter by administering cod-liver oil or irradiated yeast to the cow, but direct irradiation of cows with ultra-violet rays from an artificial source has proved unsatisfactory, although good result have been obtained with goats.[126 127]

In the relatively few studies that have been made of the vitamin value of human milk, the content of antirachitic vitamin has been found lower than the average determined for cow's milk [128 129] (see Table IV.). This fact, combined with the far greater richness of cow's milk in calcium salts, makes it difficult to understand how it comes about that artificially fed infants should be more susceptible to rickets than those which are breast-fed. It would appear as if some other protective factors, at present unknown, must be operating in human milk. Rickets is, however, by no means rare in breast-fed infants, and, while direct medication of the child should not be omitted, the lactating mother should receive a diet rich in calcium salts and vitamins, and should not neglect to expose herself to the sunshine. Antirachitic potency, previously absent, was demonstrated in the milk of a woman after treatment with ultra-violet irradiation from a mercury arc lamp by Hess and his colleagues,[130] and Macy and her co-workers [131] were able to convert a negative to a positive calcium balance in three nursing mothers by giving them cod-liver oil.

TABLE IV.—*Antirachitic Value (Vitamin D Content) of Cow's and Human Milk*

(Minimal daily dose required for prevention or cure of rickets in rats receiving a rachitogenic diet.)

Series and locality.	Description of milk.	Dose c.cm.	Observer.
I. Elstree, Herts.	From cow in dark stall (*a*) on winter feed.	12–20	Chick and Roscoe, 1926.[126]
	(*b*) on fresh cut grass.	12–20	
	From cow in the open, in summer.		
	(*a*) on winter feed	8–10	Luce, 1924,[124] Chick and Roscoe, 1926.[126]
	(*b*) on pasture.	5–10	
		5	
II. Madison, Wisconsin.	(*a*) In winter and spring.	8–12	Steenbock and others, 1930.[127]
	(*b*) At end of summer (cow on pasture).	6	
	(*c*) Cow receiving irradiated yeast, 200g. daily.	4	
III. New York	Cow's milk.	20–25	Hess and Weinstock, 1927.[128]
	Human ,,	25–30	
IV. Detroit.	Cow's milk.	30	Outhouse, Macy, and others, 1928.[131]
		(5–10) neg.	
	Human ,,	25–40, neg.	

Criterion and method.—Series I.: Rickets, histological, preventive. II.: "Line" test, curative. III.: Rickets, histological, preventive. IV.: X ray examination, bone analysis and "line" test, curative.

The association of pregnancy with osteomalacia in India and China and with increased dental caries in our own country, shows that pregnant women also require extra supplies of vitamin D, as of all other vitamins. Numerous experimental researches have shown the profound influence of diets rich in fat-soluble vitamins, when given to the mother animal during pregnancy, upon the capacity of the offspring to withstand deprivation to which they may later be subjected. Cod-liver oil or egg-yolk included in the diet of a bitch or rat during the periods of gestation and lactation has been found to confer partial or

complete protection from rickets upon the young litter when maintained after weaning on a rachitogenic diet.[132 133 133a] Similar protection to the young has been observed when the mother cow or rat was irradiated with ultra-violet light during pregnancy and lactation.[50 134]

It may be supposed that the human infant is also dependent upon the reserve stores of vitamin D with which it is endowed at birth, and the expectant mother should therefore be taught to enjoy sunshine out of doors when possible, and her diet, especially in winter, should be arranged to contain the requisite amount of the antirachitic foods. The good effect on the child of antirachitic medication of the lactating mother has been demonstrated by Weech.[135]

Factors Influencing the Dietary Requirements of Vitamin D

The amount of antirachitic vitamin which must be supplied in the food will depend not only on the amount which is derived from exposure to sunlight, but also on the composition of the diet as regards other constituents, notably on its proportion of cereal and on the supply of calcium salts and phosphates.

Cereals.—An important fact emerging from the experimental work of E. Mellanby is the evidence produced therein of the direct anti-calcifying action of cereals in diet.[136] When the food of puppies contained a certain but inadequate amount of the antirachitic vitamin, the severity of the rickets developed was found to be related to the proportion and type of cereal in the diet, oatmeal being most strongly rachitogenic, maize less so, and wheat flour the least. If the provision of vitamin D was generous, a preponderance even of oatmeal exerted no anti-calcifying influence.

In contrast to this antagonistic action of cereals, the effect of an ample mineral supply in the diet is to supplement that of vitamin D. Just as a liberal provision of the antirachitic vitamin will tend to correct the defects of a diet containing a scanty provision of calcium salts and phosphates, so abundance of these minerals, especially when presented in so favourable an admixture as is found in milk, will economise the use of vitamin D. Most human diets in this country, even the poorest, which are composed largely of cereals, contain an abundance of phosphates. It may be different in other parts of the world, as for example, in certain districts in South Africa and in Australia, where the soil is deficient in phosphates and the content of phosphorus in the locally grown wheat has been found to be much lower than that of European varieties.[137] But the mineral calcium, which in our diets is obtained chiefly from fresh vegetables, fruit, and more especially from milk, is believed to be frequently deficient in the ordinary diets in Europe and America. As the result of a study of 224 American dietaries, Sherman [138] concluded that one in six contained a supply of calcium lower than the necessary requirement, which was estimated at 0·45 g. daily per adult (about 1 g. Ca per 100 g. protein). Orr and Clark [139] found 24 per cent. of 607 analysed dietaries in seven Scottish towns to be below the margin of safety as regards the provision of this essential element. The improvement, as regards increase both of weight and height, observed in school-children in Belfast and in six towns in Scotland after administration of an extra daily ration of milk and the similarity of the results obtained whether full or separated milk were given, suggest strongly that part at least of the good effects observed should be attributed to the extra minerals supplied in the milk.[140] Although it should not be regarded as a substitute for full cream milk, the greater use of skim milk should be advocated in this country, especially in the diets of older children and adults. For, although deprived of its fat soluble vitamins, it is not only a cheap source of valuable protein, but its mineral supply will enhance the utilisation of whatever vitamin D may be available from the other constituents of the diet, or from the exposure to sunshine.

RELATION OF DIET TO CLIMATE

It is clear from the facts set out in the preceding pages that, in order to be suitably balanced as regards its provision of vitamin D, a diet must be arranged with reference to the climate in which it is to be taken. In tropical countries, where the sunshine provides abundant antirachitic vitamin, relatively little of this factor is required from the diet. The defects of the "poor" diets consumed by vast populations in tropical regions are largely corrected by the sun's ultra-violet radiation, and the more prevalent diseases do not include rickets, osteomalacia, and dental caries. The defects of such diets are however at once apparent if advantage is not taken of the beneficent action of the sun's radiations. This is well known by the frequent occurrence of osteomalacia and rickets in India in the women and children belonging to those castes observing the custom of Purdah. In like manner, in the Balkans osteomalacia is confined to the Mohammedan population.

The tragic experiences of the city of Vienna, due to the exceptional circumstances of the years following the Great War, point to a similar conclusion. In summer the amount of available sunshine was great enough to supplement the wretched diet, which was deprived of the usual sources of vitamin D; in winter it was insufficient. Rickets, almost universal in winter and spring, showed marked remission in summer. Osteomalacia made its appearance also in winter and spring; it affected the poorest section of the people and both sexes alike. The religious communities, where greater confinement was added to extreme poverty, suffered from osteomalacia in an extremely severe degree, and it persisted throughout the year.

Among populations inhabiting countries situated in northern latitudes such as Labrador, Greenland or the northern portions of Scandinavia or Siberia, reliance for vitamin D supply must be placed almost entirely on the food. Such has been the empirical experience of tribes living in these regions. The Esquimos, for example, subsisting on their natural diet of fish and meat with large supplies of fish liver and fish oil, maintain a high standard of health and have perfect teeth, while their breast-fed infants are free from rickets. When, after contact with more civilised races, their original diet is replaced in part by cereals and sugar, their health deteriorates, dental caries makes its appearance, and the children suffer from rickets.

Cereals have been introduced into Iceland only in recent times, and it is reported that while dental caries was unknown in the island until after the middle of the nineteenth century, it has steadily increased since that time with the increasing importation of cereals.

The effect of racial dietetic habits is well shown in a recent study by Kloster [141] of the incidence of rickets in a collection of hamlets situated in the Arctic circle on the Varanger Fjord in Norway, a district of latitude 70°N., where the sun is not seen in winter for two months from mid-November to mid-January. The hamlets are inhabited severally by three races, Lapps, Norwegians, and Finlanders. Of these the Lapps are the poorest and have the lowest standard of life as regards cleanliness, housing, and general hygiene,

while the Finlanders are relatively well-to-do, live in modern houses, and enjoy the degree of comfort usually found among civilised Europeans. The incidence of rickets was high in the locality but found to be least among the Lapp communities (see Table V.). Kloster attributes this fact chiefly to the large amount of fish (to 1 kg. daily) and of fish-liver oil (to 70 g. daily) taken regularly by these people and also to the nature of their clothing which, being made of reindeer skin, permits the women and children to remain out of doors in the severe weather to a much greater extent than is possible for the other inhabitants. The incidence of rickets was highest in a relatively prosperous village inhabited by Finlanders who enjoyed a much "better" diet, including milk and meat, but consumed much less of the potent antirachitic foods, fish liver and fish-liver oil.

TABLE IV.—*Incidence of Rickets among Infants and Children under 7 years of age in 11 villages situated on the Varanger Fiord, Norway. (Latitude 70°N.)*

(Kloster, 1931.[141])

Locality.	Children.	With rickets.	Percentage of total.	Diet (daily per "man").	General hygiene (housing, cleanliness).
Whole district.	376	163	43	—	—
Skallelv (Finlander).	41	30	73	"Better," including milk, Ca 500 c.cm. meat, &c.	Good.
Nesseby (Lapp).	53	19	36	Fish to 1 kg.; fish-liver oil to 70 g.	Inferior.

A recent investigation, by Hansen, of Copenhagen (quoted by Maxwell[26]), of ancient skeletons obtained from the Norse colony at Herjolfsenes in Greenland (which was founded by Eric the Red in the ninth century and became extinct in the fifteenth century) showed pelvic deformities and suggests that this inhibiting effect of osteomalacia on reproduction was the cause of the disappearance of the settlement. If this is true, a striking example is afforded of the result of the failure of the settlers to adapt their diet to a climate providing a minimum of antirachitic radiation.

In the British Isles the adaptation of diet to climate must be regarded as imperfect. Rickets is a common disease and dental caries universal. The researches of M. Mellanby, showing the association of dental caries with defective structure, leave no room for doubt that the same causes operate in the ætiology of this disease and of rickets. Her observations have shown the effect of antirachitic agents in checking the spread of dental caries, and are promising enough to indicate that this disease may be successfully countered by methods found efficacious in prevention and cure of rickets.

The vitamin D-containing foods, butter, eggs, cream and milk are, however, the expensive foods, and the problem is to obtain the necessary supply of antirachitic vitamin for the poorer section of the population in the most economical way. For infants and growing children it is probable that a small daily ration of cod-liver oil, given especially during the winter months, is the surest and most economical procedure. Abundance of calcium salts and phosphates in the diet will enable the available vitamin D to work to better advantage. Milk is the most valuable source of these minerals, and while full cream milk is expensive, separated milk is cheap and might well be included more widely in the ordinary dietary. The drawback of expensive transport might be solved by drying or converting to a soft cheese before use; in rural districts, where a dairy industry exists, the skim milk could be made immediately available especially to poorer families where large amounts of full milk cannot be afforded.

To limit cereals in a diet would also enhance the value of its antirachitic constituents. This is, however, hardly a practicable proposition, for since bread is the cheapest form in which to obtain necessary calories, it is bound to remain the staple article of diet. But, especially for children, more use might be made of potatoes as a substitute for bread, not only in the interests of correct nutrition but of national economy.

Finally, it is imperative to make full use of the relatively small amount of natural sunlight with which our climate is endowed. In winter, spring, and autumn, the play hours for children out of doors should be arranged to coincide with the period round about noon, when the sunshine contains its maximum antirachitic radiation. In the use of artificial sources of ultra-violet radiation, it should be remembered that many of these (e.g., the mercury-vapour quartz arc) emit powerful radiations of very short wave-length, which are absent from the sun's radiation reaching the earth on which the human race has been evolved. The action of these rays on the living organism is little understood, and their use should only be permitted under strict medical supervision.

The practical suggestions contained in the above paragraphs are mainly derived from the results of recent experimental work, much of which has received ample confirmation in clinical experience. The dissemination of this knowledge among the general public and its application to the improvement of the national diet, to the preservation of health and to the prevention of disease must, however, be the work of the medical profession and the concern of the general practitioner as well as of the administrative health officer.

As Dr. Palm's observations on the relation between sunshine and rickets formed the starting point of these lectures, so the series of recommendations with which he closed his second paper will form a fitting conclusion. For eradication of rickets from the community, he proposed among other measures, "education of the public to the appreciation of sunshine as a means of health. Such knowledge," he wrote, "will stimulate efforts for the abatement of smoke and for the multiplication of open spaces especially as playgrounds for the children of the poor."

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THE TREATMENT OF GENERAL PARALYSIS OF THE INSANE BY MALARIA AND SULPHUR

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THE treatment of general paralysis of the insane by malaria was started at Springfield Mental Hospital in 1923. In November, 1929, malarial therapy was temporarily abandoned for the purpose of carrying out research work on the effect of sulphur in the treatment of general paralysis of the insane. At present both are being used.

There has been some discussion on what constitutes a case of general paralysis of the insane. We personally believe this condition to be one of the possible sequelæ of a syphilitic-meningo-myelo-encephalitis. Every case mentioned in this paper has been diagnosed on a combination of mental changes, physical signs, and examination of the cerebro-spinal fluid. We regard a positive Wassermann reaction as being especially important, it being generally agreed that the reaction is positive in the cerebro-spinal fluid in nearly 100 per cent. of cases. This has recently been shown by McDiarmid.[1]

The patients have in some cases been infected direct from the mosquito, but for the most part by inoculation with 3 to 5 c.cm. of infected blood, given intramuscularly. In a few cases, infected blood has been given intravenously in order to get a quick reaction. Each patient is allowed to have 10 or 12 rises of temperature, if possible, 104° to 106° being aimed at. Tepid sponging is not commenced unless the temperature rises over 105°. It seems essential to success to allow the pyrexia full scope, even at the cost of considerable exhaustion to the patient.

It might be tentatively suggested that the failures of this treatment complained of in some of the general hospitals are due to the stopping of the pyrexia too soon, either for fear of killing the patient, or else because an increase in the mental symptoms of the patient makes it impossible to keep him in the hospital in such a state.

We find the most helpful clinical signs to show that the patient can stand no further pyrexia are (1) the pulse-rate remaining high accompanied by arrhythmia during the apyrexial period. While the temperature is high the pulse-rate is often 120 to 140 and sometimes irregular, but with the fall of the temperature it should rapidly return to normal limits. (2) Inability to keep the tongue fairly clean and moist is another danger sign, and finally (3) undue prostration during the apyrexial periods must be regarded as serious. These points should, whenever possible, be controlled by a constant examination of the blood picture and number of parasites per field.

Every patient is, of course, blanket-bathed after the rigor. The bowels are kept open with calomel and saline, or, where the former is badly tolerated, with some such aperient as mist. sennæ co. The dietary allowed is liberal throughout. Plenty of bland fluids are given, and frequently, where there is any cystitis or tendency to retention, hexamine as well.

The malaria is stopped by giving quinine bisulphate (Burroughs and Wellcome soft-coated tablets) at first in doses of grs. 10 three times a day for a week, and then grs. 15 daily for a month. Finally, a course of neokharsivan is given, the doses being 0·3, 0·45, 0·6, 0·75, and 0·9 g., each dose given weekly.

There does not appear to be any specific contra-indication to giving malaria. The greatest danger seems to lie in advanced, emaciated cases, especially those which have very severe syphilitic lesions of the cardiovascular system, or which show a good many ataxic symptoms and are very tremulous. Wagner-Jauregg advises preliminary cardiac treatment as a safeguard. One of our patients, as previously recorded,[2] died from rupture of the spleen, and another died following acute retention. Enlargement of the spleen is nearly always present, and watch should be kept for undue enlargement, especially in anyone who has previously had malaria.

It is in some of the advanced cases that treatment by sulphur is indicated as will be shown later. It is, of course, possible to modify malarial therapy by damping the pyrexia down with small doses of quinine or by using a quartan strain, but we have not had much experience of this. The Board of Control, in their report,[3] give details of this modification.

REMEDIES USED

In considering the results of treatment, we have divided up the patients into four groups—namely, those treated with (1) malaria alone, (2) sulphur alone, (3) sulphur following malaria, (4) malaria following sulphur. It must be pointed out that of Group 3 the majority were patients who had received malarial treatment in the early years, but, not having made sufficient improvement for discharge, were still in hospital. These patients were inoculated with sulphur, not so much with the idea of a cure as to study the reactions of the sulphur. Had these cases been included in Group 1, it is obvious that the percentage of recovery from malaria alone would be less.

From July, 1923, to the present date, 76 patients have been treated with malaria and no sulphur. It must be remembered that of these some were already in a demented state when inoculated, and could not be regarded as favourable cases for treatment. We agree emphatically with the general opinion that the sooner treatment is started the greater the likelihood of recovery. Of the above 76 patients, 31 have been discharged and, to the best of our knowledge, are still keeping well, 11 are still in hospital, while 34 have died. This is a recovery-rate of approximately 40 per cent., which is slightly greater than the usual estimate, but this estimate would be lower were cases treated with sulphur following unsuccessful malarial treatment included, as specified above. Of the 11 patients still in hospital, one was originally discharged after treatment but relapsed. Of the 36 patients who have died, four were discharged after treatment, but relapsed and had to be readmitted. In nearly every case, physical improvement occurs.

A preliminary report on the use of sulphur has already been published.[4] Since then the general technique has been much the same. Several variations in dosage have been tried but, broadly speaking, it seems necessary, as Schroeder[5] originally suggested, to increase the dosage by 1·0 c.cm. at a time to keep up the pyrexia. On the other hand, if the dosage is suddenly reduced, an equally good rise may occur. Thus, in one of our cases the following took place :—

Dose (c.cm.)	..	1	..	2	..	3	..	4	..	5
Temperature	..	104·2	..	103·8	..	103·2	..	104·2	..	103·4
Dose (c.cm.)	..	2·5	..	3	..	3	..	4	..	7
Temperature	..	104·0	..	101·4	..	103·0	..	101·8	..	103·4

In some cases it has been impossible to keep up the pyrexia even by increasing the dosage by 2 or 3 c.cm. Such a case gave the following :—

Dose (c.cm.)	..	1	..	4	..	5	..	6	..	7
Temperature	..	98·4	..	100·4	..	102·2	..	103·0	..	99·0
Dose (c.cm.)	..	8	..	9	..	5	..	7	..	10
Temperature	..	101·6	..	102·4	..	100·4	..	100·0	..	101·2

Another method tried in order to obtain higher temperatures was to inject an equal number of cubic centimetres into each leg in order to get two local reactions. This gave a slightly greater pyrexia, but not enough to warrant the extra discomfort. Laptain [6] states that injections of large quantities of sulphur do not necessarily produce a high pyrexia, also that splitting the dose and giving it in two sites is not particularly effective.

Mr. Ward and Mr. Haines, of British Colloids, Ltd., suggested that it was possibly a compound of sulphur with olive oil which was producing the pyrexia, rather than the elemental sulphur in solution. In order to investigate this point, British Colloids, Ltd., were good enough to make up a series of solutions; different vehicles being used, and the following have all been tried :—

Sulphur in olive oil.
" " olive oil heated over a long period.
" " " " to 200° C.
" " rape oil.
" " cod-liver oil.
" " peach kernel oil.
" " sterile paraffin.
" " an aqueous solution.

The two solutions in olive oil heated, one over a long period and the other to 200° C., were both inert. Of the others, all gave some degree of pyrexia, but there seems to be no definite indication as to which solution is going to give the best pyrexia.

Shilvock [7] did not get any pyrexia with injections of sulphur in water, but has contradicted this in a later paper, using a stronger solution. Mackay [8] produced pyrexia with a suspension of sulphur in a mixture of 1 per cent. acacia in physiological solution of sodium chloride.

In view of the evidence that all the solutions of sulphur gave approximately equal degrees of pyrexia, one is forced to the conclusion that it is the elemental sulphur and not a compound that produces the reaction.

EFFECTS OF SULPHUR

It will be seen from Table I. that there is a great variation in the degrees of reaction, and we could not satisfy ourselves that any one solvent was particularly indicated as giving the best degree of pyrexia. On

TABLE I.—*Reactions in Three Cases*

Case 1.		Case 2.		Case 3.	
Dose and vehicle.	Max. Temp.	Dose and Vehicle.	Max. Temp.	Dose and vehicle.	Max. Temp.
c.cm.		c.cm.		c.cm.	
1 S. in O.O.	98·4	1 S. in P.K.	100·6	1 S. in O.O.	100·0
2 "	100·4	2 "	102·4	2 "	100·4
3 "	100·4	3 "	103·0	3 "	100·2
2 "	98·4	3 S. in O.O.	102·4	2 "	102·0
4 "	98·6	4 "	100·4	3 "	100·4
4 S. in P.	100·4	5 "	100·2	4 S. in P.K.	102·0
4 "	101·2	3 S. in A.	100·4	5 "	101·6
5·5 "	103·0	4 "	103·8	5 S. in A.	102·2
5 S. in A.	100·4			6 "	102·4
6 "	101·8			7 "	99·6
7 "	101·0			8 "	101·2
1 S. in P.K.	98·6				
2 "	101·0				
3 "	101·2				
4 "	100·6				
8 S. in A.	101·0				

S. in O.O., Sulphur in Olive Oil; P., Paraffin; A., Aqueous; P.K., Peach Kernel.

the whole, we favour the old preparation of sulphur in olive oil.

There seems little doubt that individuals vary considerably in their reactions to injections. Mackay [8] noticed this. This probably accounts for the difference in results obtained by different observers. Patterson and Switzer,[9] Laptain,[6] and Levaditi,[10] all experienced difficulty in producing good pyrexia, while Shilvock [7] and Power [11] both reported excellent results.

No definite immunity appears to be developed to the action of sulphur. Second and third courses can be given in close succession, without much drop in the degree of pyrexia obtained. Power [11] notes the same fact. This is an advantage over malaria.

One of the most interesting effects of these injections is their influence on the blood; this has been already mentioned by MacMillan and Wyllie,[12] Power,[11] and Loberg.[13] Laboratory investigations were made of the cases under treatment with sulphur compounds. Since no scientific benefit will accrue from a detailed enumeration of all these results, it will suffice to give the average findings of the various cases investigated. Most of the cases had the urea content of the blood estimated both before and after the sulphur injections, and in no case could any material alteration be claimed to have occurred. A more thorough examination was made as to the reaction of the leucocytes after the injection of sulphur. Sixteen cases were thus investigated, and examinations were made before and after injection. The investigations after the injections were made at hourly intervals up to three hours, but only after the first few doses of the compound and not when the treatment was well established. In a few cases examinations were made at hourly intervals in the latter part of the treatment, to see if any particular tolerance could be said to be established, but it may be at once stated that the leucocytes behaved in much the same way, whether the case was commencing or at the end of a course. Clinically, also, this absence of any establishment of tolerance was noted frequently, for in patients who, after an interval, underwent a second course of sulphur or received injections of sulphur in different "vehicles," it was found that they reacted quite as well the second time as at the first. It has been mentioned in another part of this paper that several types of "vehicles" were used to suspend the sulphur in (peach-kernel oil, olive oil, rape oil, medicinal paraffin, &c.), and here again it was found that a patient, both clinically and on the evidence of the changes occurring in the leucocytes, established no particular tolerance to the "vehicle." Indeed, the injection of the "vehicle" without sulphur produced no reaction at all, hence, whatever reaction occurs may be claimed to be due to the sulphur.

The reaction which the injection of sulphur produces on the leucocytes is one of leucocytosis, and this has been always noted by observers interested in this effect of sulphur. Accompanying this leucocytosis is a smart rise of temperature which in our cases average 102–103° F., but it is an interesting fact that a high temperature does not necessarily mean a high leucocytosis. The temperature and the leucocytosis seem to bear no direct relationship to one another, and this fact was observed many times.

In discussing the leucocytosis the figures mentioned relate to thousands, and are only round figures for the sake of brevity. It was found that after the first hour the average count was from 10 to 12 (10,000 to 12,000 per c.mm.), but in one case reached 14, after half an hour. The average increase on the "normal" after one hour was about 2. A maximum was reached in about three hours, and this on an average was 20, but in one case was 37. The duration of this leucocytosis was very variable, for in some cases it showed no great diminution in three days, in others it was almost normal at the end of 24–36 hours. In one or two cases it showed signs of falling earlier than this. One interesting feature of some of these counts was that after a preliminary rise at the first hour, a definite fall occurred at the second hour, with a subsequent marked rise at the third hour. This occurred in more than one case, and thus was not an accident of technique.

Since we had the advantage of supplies of sulphur in various types of suspension, our investigations were also directed to seeing if a variation in the "vehicle" could be said to make a difference to the clinical and leucocytic reaction. As has been shown, there is some evidence that the vehicle in which the sulphur is suspended does make a difference. If the sulphur compound is heated up to a certain point, 200° C., the preparation is apparently inert, and neither rise of temperature nor leucocytosis results. Sulphur in peach-kernel oil produced both a good reaction and leucocytosis, but seems less certain and the reaction less marked than olive oil, which in most cases could be relied on to give both a good reaction and leucocytosis. Sulphur in cod-liver oil seemed relatively inert, sulphur in medicinal paraffin and sulphur in aqueous suspension had a moderate effect, while sulphur in rape oil perhaps a little less.

Mackay [8] has suggested that the mechanism of the production of the pyrexia depends on the liberation of protein from muscular tissue damaged by the sulphur; or liberated hydrogen sulphide.

The injections of sulphur seem less likely to cause material harm, even than malaria. They do, of course, produce some very painful reactions; and in three cases out of over 500 injections abscesses developed. They had more the appearance of abscesses resulting from chemical necrosis, although from the pus in one *Staphylococcus albus* was cultivated.

RESULTS

Since November, 1929, up to the present date, 13 cases of general paralysis of the insane have been treated by this method; of this number 6 have been discharged, 6 have died, and 1 remains in hospital. This is a recovery-rate of approximately 46 per cent.

In addition to the above patients who were treated with either malaria or sulphur, a certain number were treated with both. Fifteen patients who had been treated with malaria but had not recovered were given a full course of sulphur. None of these have recovered since, 11 are still in the hospital, and 4 are dead. This bears out what we believe has been generally observed, that if the first good pyrexial course does not promote recovery, subsequent courses are not successful.

Five patients were treated with sulphur and subsequently malaria. Of these one recovered, one died, and three remain in hospital. These results are set out in Table II.

TABLE II.—*Results of Pyrexial Treatment*

—	Total treated	Recovered	Still in hospital	Died.
Malaria alone	73	31	11	34
Sulphur alone	13	6	1	6
Malaria followed by sulphur .	15	—	11	4
Sulphur followed by malaria .	5	1	3	1

The recovery-rate in the two methods of treatment is approximately the same, although it is hardly fair to compare 76 cases over six years' work against 13

cases and two years' work. Malaria gives a quicker recovery than sulphur, probably as a result of the higher temperature, also probably for the same reason there seems to be less tendency to relapse after malaria.

Three of the cases treated with sulphur made wonderful recoveries but subsequently relapsed, two being now dead, while the third recovered after a course of malaria. Sulphur is probably advantageous when one is dealing with an advanced case, since the risk is less and the leucocytosis probably more beneficial than the leucopenia in malaria.

The report of the Board of Control[3] states that malaria tends to accelerate death in a number of cases. In a very debilitated case it is probably well worth while giving a preliminary course of sulphur to improve the general condition, and to follow it by a full course of malaria.

We believe that it might be well worth trying a course of injections of sulphur in cases of tabes dorsalis which have not responded to the usual treatment. We have seen remarkably good physical results in patients whose history shows that for years before admission they had symptoms of tabes without the presence of any mental changes.

In a hospital where there are numerous general paralytics, so that the malarial strain can be kept by inoculating one patient from another, it is undoubtedly simpler than injections of sulphur. It is, on the whole, less painful for the patient, and it means less work for the nursing staff. Where isolated cases are to be treated, or where malaria is difficult to obtain, or in patients who do not react to malaria, sulphur is invaluable.

SUMMARY

1. An account is given of 109 cases of general paralysis of the insane, treated with malaria and sulphur, over a total period of eight years.

2. Both malaria and sulphur produce an excellent pyrexia, but the pyrexia from malaria is usually higher and gives quicker and more lasting results.

3. Sulphur is recommended where the patient is too ill to stand malarial treatment or where there is no reaction to malarial treatment.

4. It is elemental sulphur and not a compound which produces the pyrexia.

5. Injections of sulphur in solution produce a considerable leucocytosis. The average leucocytosis of all counts investigated was 19,500 per c.mm., the highest being 37,000 per c.mm. The lowest was 10,000, but this was an increase of 3000 on the normal prior to the injection.

6. The averages for each "vehicle" in which the sulphur was suspended were as follows: olive oil, 22,500 per c.mm.; peach-kernel oil, 19,500 per c.mm.; medicinal paraffin, and in aqueous suspension, 17,500 per c.mm.; rape oil, 17,000 per c.mm.; heated oil, no change.

7. It appears to us that sulphur suspended in olive oil is the best of these preparations and produces the most constant reaction and leucocytosis.

8. Leucocytosis is very variable, starts to be noticeable after one hour, and reaches a maximum in three hours.

9. Leucocytosis may last well-established for three days, or rapidly fall in 24–36 hours.

10. The temperature and the leucocytosis in a reaction to an injection of sulphur bear no definite relationship to one another.

11. There seems to be no alteration of the blood-urea content as the result of sulphur injections.

12. There is evidence recently to suggest that injections of sulphur activate a malarial reaction in persons who have been inoculated but have not responded.

In conclusion, we should like to express a very real debt of gratitude to British Colloids, Ltd., for their help and suggestions, also to the male nursing staff, whose help in carrying out endless observations on temperatures, &c., has been given with the greatest enthusiasm. We should like to correct a mistake made by one of us, and record that the original suggestion for the use of sulphur in the treatment of general paralysis of the insane was made by Dr. Tutunji.[14]

We gratefully express our thanks to Dr. R. Worth, medical superintendent of Springfield Hospital, for his permission to publish these cases.

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THE RÔLE OF TISSUE JUICES IN THROMBOSIS

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THROMBOSIS has been defined as intravascular clotting during lifetime. Although this definition is inadequate, since the most simple type of thrombus does not contain clotted blood, the most common forms of natural thrombi are almost wholly composed of coagulated blood, and their histological structure closely resembles that of the intravascular coagula produced by the intravenous injection of tissue extracts. Illustrations are provided by the micro-photographs published by Mason.[1] A relationship between natural thrombosis and the intravascular coagulation induced by the action of tissue extracts is apparent, but the capacity of the natural juices released from broken tissues to induce intravascular coagulation in contradistinction to that of tissue extracts, obtained by extraction with acid or salts and "purified" by precipitation and re-solution, has been investigated only recently and many aspects of natural thrombosis remain obscure, such as the common absence of the rapid occurrence of intravascular clotting after extensive trauma when fresh tissue juices may enter the blood stream and the relatively high frequency of thrombosis during the puerperium, particularly after childbirth.

Recent experiments on anæsthetised cats indicate a sharp contrast between the extensive intravascular clotting which follows the rapid intravenous injection of extracts of testis, muscle, or kidney, and the complete maintenance of the fluidity of the circulating blood of male animals when fresh tissue juices, obtained by centrifuging the finely ground tissues, are substituted for the tissue extracts, even when the amount of tissue juice introduced into the circulation exceeds that required for the rapid and complete

coagulation of blood shed into paraffined vessels. (A description of the technique employed and illustrations of the experiments are given by Armitage, Pickering, and Mathur.[2]) At first sight the results with female animals appeared contradictory. But a re-examination of the notes of the experiments, supplemented by further experimentation, showed that localised intravascular clotting, limited to veins below the diaphragm or to the left ventricle of the heart, follows the rapid intravenous injection of non-lethal amounts of the fresh juices of muscle or kidney (e.g., 10 c.cm. of the juice into animals weighing from 3 to 4 kg.) when the animals are in an advanced stage of pregnancy, although the fluidity of the whole of the blood in the circulation is maintained in non-pregnant females after the rapid intravenous injection of equal or even greater amounts of the fresh tissue juices. Moreover, a like difference in the resistance of the circulating blood of non-pregnant and pregnant females to intravascular or intracardiac clotting by the action of fresh blood-serum has been described by Armitage, Pickering, and Mathur.[2]

Blood shed from the carotid arteries of both non-pregnant and pregnant females after the intravenous injection of fresh tissue juices clots much more rapidly than normal blood, but intravascular clotting may be induced in pregnant females by the intravenous injection of the tissue juices of muscle or kidney when there is no indication of hypercoagulability of the blood prior to the introduction of tissue juices into the circulation. It was also found that blood obtained from the uterine veins may be extremely hypercoagulable in pregnant animals.

DISCUSSION

If the natural resistance to intravascular clotting is governed by similar conditions in the cat and man, explanations are apparent by the common absence of the rapid occurrence of intravascular clotting after extensive trauma in human beings when tissue juices may invade the blood stream and of the relatively high frequency of thrombosis during the puerperium. In the latter condition it appears that the stability of the blood plasma is sufficiently disturbed to permit localised coagulation by the action of tissue juices, and this conclusion is consistent with the evidence, collected by Pickering,[3] that alterations in the composition and condition of the blood plasma, which conduce to thrombosis, occur during the puerperium and persist after childbirth.

Local factors are indicated by the limitation of thrombosis in all our experiments on pregnant animals to the veins below the diaphragm or to the left ventricle of the heart. Of these factors, either stasis or slowing of the circulation is probably the most important. Both Hayem [4] and Feissly [5] demonstrated that blood confined in the saphenous vein is coagulated by concentrations of fresh blood-serum which do not induce clotting in circulating blood, and Armitage, Pickering, and Mathur [2] observed that blood confined in a pulsating heart by ligatures resists coagulation by amounts of serum which may induce intracardiac clotting when the heart has ceased beating. Moreover, one of us (J. W. P.) found that the introduction of one or two drops of fresh muscle juice into blood remaining stagnant in the excised vein of an ox may induce clotting, and Patey [6] has provided evidence of the importance of venous stasis in the production of artificial thrombi in the injection treatment of varicose veins.

The possibility that trauma may induce delayed thrombosis by a bodily reaction which increases the number of blood platelets in the circulation has gained prominence from the work of Dawbarn, Earlam, and Evans,[7] and from a debate at the Royal Society of Medicine.[8] It is suggested that the links in the chain of causation of thrombosis after surgical operations and childbirth are:—trauma, a numerical increase of platelets, the liberation of coagulants from these corpuscles, enhanced coagulability of the blood, and, finally, thrombosis. Evidence has, however, been collected by Pickering [9] and by Mackay [10] which suggests that a superabundance of platelets does not suffice for the inception of thrombosis, and Armitage, Pickering, and Mathur [2] found that the whole of the platelets in the circulation can be disintegrated without provoking thrombosis. Nevertheless, the presence of a great excess of circulating platelets probably contributes to the rapid growth of a thrombus, particularly when the histological structure of the thrombus shows laminæ of platelets alternating with clotted blood, and this suggestion may account for the correspondence in time, noted by Dawbarn, Earlam, and Evans,[7] of the clinical indications of post-operative thrombosis with a rise in the number of circulating platelets.

It thus appears probable that the ingress of the juices of broken tissues into the circulation, although it may primarily induce hypercoagulability of the blood and later provoke an increase of the platelets in the circulation, does not suffice for the inception of thrombosis; but both these factors are probably important participants in the inception or growth of thrombi when the condition of the blood plasma favours the deposition and clumping of platelets or when the stability of the plasma colloids is reduced.

Experimental support is afforded for the practice of increasing the speed of the circulation as a prophylactic measure against thrombosis, and certain other conclusions are suggested. Attempts should be made to reduce as far as possible the rapid absorption of tissue juices after childbirth. Recent experiments indicate that the agglutinability of blood platelets is much less after a meal of carbohydrates than of meat (Mills and co-workers,[11] Pickering [12]), and Mills [13] advises a low protein diet for at least two weeks after childbirth or severe surgical operations, particularly those involving the abdominal or pelvic regions. A like dietary, combined with measures which increase the circulation, seems worthy of trial in cases of fracture of the femur, which exhibit a high frequency of thrombosis. The intravenous injection of substances which produce hypercoagulability of the blood appears inadvisable in the puerperal state, and in this connexion it should be noted that the initial hypocoagulability of the blood which is produced by the intravenous injection of either heparin or sodium citrate is followed by hypercoagulability. The value of the treatment of thrombosis by the intravenous injection of these anticoagulants therefore seems doubtful.

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THE CONNEXION BETWEEN THE CARDIAC "NODES"

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Although physiological experiment suggests the existence in the heart of a communication of some kind between the sino-atrial and atrio-ventricular nodes, the existence of a distinctive anatomical connexion was not known until recently.

In larval stages of a primitive vertebrate (*Lepidosiren paradoxa*) all the conducting mechanisms which have so far been described, whether nervous or "atypically neuromuscular" in nature, are represented in respect of their anatomical position and connexions by a continuum of neural origin and structure.[1] The establishment of this fact made it the more desirable that the human heart should be reinvestigated by some method which would reveal its nervous elements with precision as well as its general histological structure. Bielschowsky's method is ideal for this purpose, since it reveals neurofibrillæ very distinctly as well as the characteristic features of muscular striation on their first appearance.

A human embryo 24 mm. in length, prepared by this method and sectioned, showed the nervous system perfectly differentiated even to the digital nerves of both limbs and the involuntary nervous system of all the thoracic and abdominal viscera. A wax plate model (× 100) of the heart facilitated approximate reconstruction of the cardiac nerves in wire. The models demonstrate the continuity of the atrio-ventricular node with the nervous system, and establish the fact that a connexion does exist between the two nodes, the sino-atrial and atrio-ventricular. The histological features of this portion of the nervous "core" of the heart deserve more detailed description.

The atrio-ventricular node extends for a considerable distance cranio-caudally beneath the endocardium lining the ventral wall of the sinus venosus. It is the meeting point of several streams of neurofibrillæ:—

(*a*) From a cranial direction a voluminous stream occupying the mesocardium in front (headwards) of the foramen primum.

(*b*) From a dorso-caudal direction, a similar stream occupying the composite structures caudal to the septal mechanisms. (But there is no evidence that a nerve crosses the plane of union of tissues in any part of the heart.)

(*c*) A small stream from the atrial roof by way of the atrio-ventricular groove (cp. A-V ledge of Robertson[2]). This stream traverses a small *left* atrio-ventricular node which has not hitherto been described at the edge of the septum primum. The existence of this node appears to dispose finally[1] of Koch's view that the nodes were left and right structures respectively.

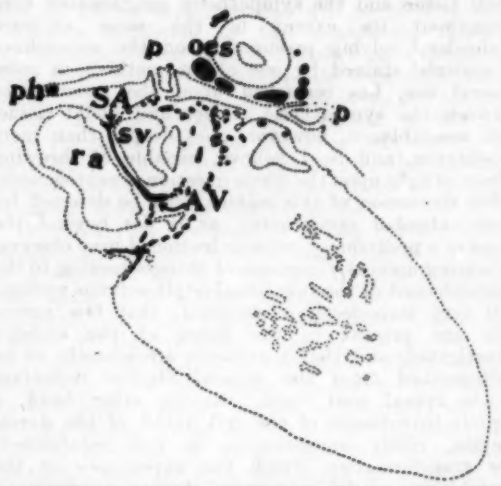
(*d*) A similar right atrio-ventricular band.

The atrio-ventricular node contributes throughout the greater part of its length, together with both atrio-ventricular bands, to the formation of a nervous "sheath" investing a right and a left "rosette" of cell nuclei. The two "rosettes" are imperfectly separated from one another. They occupy a position much deeper in the ventricular septum than that described for the A-V node, and mark the commencement of the right and left moieties of the muscular bundle of His. From the nervous investment, nerves are derived which accompany the bundle itself.

There is one further connexion—namely, the projection of the node itself dorsally in the base of the right venous valve to the dorsum of the heart where it becomes continuous with the caudal end of the sino-atrial node. (Figs. 1 and 2.)

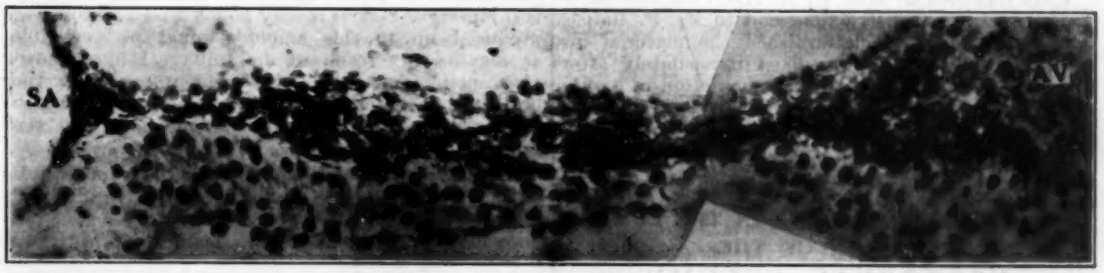
In their histology, the neural elements of this formation are composed of very tortuous neurofibrillæ seen in places in close relation to rather small neuroblastic nuclei. In such situations, the neurofibrillæ, denser than elsewhere, form a short, curved, matted thickening—a fibrillar "fleck" partly

FIG. 1



sv, separates the right venous valve from the base of the septum secundum. Irregular black markings are nerves. SA, sino-atrial node. AV, atrio-ventricular node. ra, right atrium. sv, sinus venosus. p–p, right and left inferior pulmonary veins. œs, œsophagus. ph, right phrenic nerve.

FIG. 2



The connexion between the sino-atrial and atrio-ventricular nodes in the base of the right venous valve; human embryo, 24 mm. (Zeiss 2 mm. apochromatic objective. Leitz compensating ocular, × 8).

[1] Trans. Roy. Soc. Edin., 1932, lvii., 225.
[2] Quart. Jour. Microscop. Sci., 1914, lix., 110.

surrounding the nucleus. Non-nervous elements, if they exist, are not distinguishable from the general mesoderm. The appearance of the node differs from that of the nervous tissue elsewhere in the heart, in the concentration and character of the nuclei, which are absent from the nerve bundles. Detailed inspection reveals a close similarity between the nodal tissue and the sympathetic ganglionated cord throughout its extent in the same embryo. Walmsley,[3] relying presumably on the appearance of material stained by one of the methods in more general use, has remarked upon the resemblance between the sympathetic *Anlage* and nodal tissue. This resemblance, however, goes deeper than mere appearance, and is, I believe, capable of throwing a flood of light upon the whole question of neurogenesis. While discussion of this matter must be deferred for more extended opportunity, as it lies beyond the scope of a preliminary communication, I may observe, as bearing upon the sequence of changes leading to the establishment of the functional adult nervous system, still very imperfectly understood, that few nerve-cells are present in the heart of the embryo investigated, and that nerve-cells are scarcely to be distinguished from the general fibrillar reticulum of the spinal cord itself. On the other hand, a fibrillar investment of the cell nuclei of the dorsal ganglia, richly anastomotic, is well established. The transformation which the appearance of the neuroblastic nuclei undergoes during neurogenesis has not yet received the discriminating analysis it deserves. In my preparations, the earliest of this series of changes is represented by the state of the nuclei of the nodal tissue. In the sympathetic cord, nuclei of the same and slightly later stages are present; in the anterior horn region of the cord, a stage corresponding to that reached by the "older" of the sympathetic nuclei. The dorsal ganglionic nuclei are much more advanced.

The caudal end of the sino-atrial node communicates with the right phrenic nerve. I have not found a corresponding cardiac communication with the left phrenic nerve.

I am indebted to Miss M. M. Hurst for assistance in the work of reconstruction, and to Mr. P. Malpas for the specimen which furnished the material for this investigation. It was fixed immediately after removal from the uterus at the completion of a sub-total hysterectomy. The work has been assisted by a grant from the Medical Research Council which I gratefully acknowledge.

[3] Quain's Anatomy, London, 1929, vol. iv., pt. iii., p. 97.

PRIMARY MAL-ROTATIONS IN THE LUMBAR PORTION OF THE VERTEBRAL COLUMN

By Edgar Cyriax, M.D. Edin.

In this paper I want to point out several facts which are either not recognised at all or else are systematically denied by the medical profession as a whole.

In the first place, it is necessary to distinguish between primary rotations of the spine—i.e., those which arise per se and not as the result of any existing deformity—and secondary rotations such as are induced by scoliosis; it is evident that their causation, pathology, and treatment are different, just as, say, a primary mal-rotation of the semilunar bone of the wrist would be distinct from a secondary one induced by pressure from callus after fracture of the lower end of the radius. In view of this distinction I shall in this paper use the term "mal-rotations" to denote primary ones.

Although scoliosis is universally defined as a lateral curve of the spine, there is still very much doubt as to whether this is meant to be a curve on itself—i.e., in its own antero-posterior plane, or a curve as regards the corresponding plane of the body. This uncertainty is, I consider, the cause of many misconceptions concerning scoliosis, not merely as regards its pathology but, what is far more important, its treatment. In my opinion scoliosis is a lateral curve of the spine *on itself* and not on the antero-posterior plane of the body, unless of course these two planes coincide.

I shall endeavour to demonstrate the following facts concerning rotations in the lumbar vertebræ:

1. Primary mal-rotations can occur per se.
2. Primary mal-rotations can both simulate scolioses and be their direct cause.
3. Primary mal-rotations, being displacements, are to be treated as such.

PRIMARY MAL-ROTATIONS CAN OCCUR PER SE

This fact, though not actually denied in the enormous literature on scoliosis, is almost always entirely ignored, the few instances in which it has been mentioned appearing to have aroused no interest at all. On the other hand, I have frequently had medical men categorically deny that such mal-rotations can ever occur. Up to the present, however, no one holding this opinion has been able to give me one single reason to substantiate his statement. Personally I contend—and surely this fact cannot be contradicted—that a bone that can normally be moved in any one particular direction can also become displaced and remain displaced in that direction if suitable conditions are present. It is a fact that the lumbar vertebræ, in which normal rotation can take place, can readily become the seat of pathological mal-rotations.

I have often heard it argued that, as the normal maximum of physiological rotation between any two lumbar vertebræ is only about 2°, a mal-rotation produced up to this amount would be negligible as regards any resultant deformity. I must, however, point out that pathological rotation in the lumbar region can take place through a much greater range than 2°. The mechanism is not the same in the two cases:

(*a*) Normal rotation takes place round a centre situated about the middle of the body of the vertebra and continues until arrested by impact of its articular processes with those of the bone below.

(*b*) Pathological rotation takes place round a centre situated in the articular processes and continues until arrested by ligamentous or muscular tension, the bodies and spinous processes of the bone moving in opposite directions.

The fact that such pathological rotation can take place is hardly recognised at all by pathologists, orthopædic surgeons, or curators of museums. Many pathological museums have specimens labelled "lateral-rotary scoliosis," or even "scoliosis" pure and simple, in which there is but little actual lateral curve but an amount of pathological rotation equivalent to two or three times the maximum physiological normal. (For example, I have seen a mal-rotation of the third lumbar vertebra through about 18°, combined with lateral flexion through about 10°, described as "lateral flexion.")

By far the commonest site for a mal-rotation in the lumbar vertebræ is either in the joint between

the fourth and the fifth vertebræ or in the one between the latter and the sacrum. Such mal-rotations usually arise suddenly, the most frequent cause being too energetic trunk twistings, during athletic sports or in an endeavour to save oneself when falling. In these cases a rapid rotary movement is propagated from above downwards until it is arrested by the inertia of the pelvis. Under normal circumstances the joints between the fourth and fifth lumbar vertebræ and between the latter and the sacrum are strong enough to prevent any rotary displacements, but if either of the articulations is caught unawares or is too weak, then a mal-rotation may occur. These mal-rotations are especially apt to occur in females, in whom, as is well known, the pelvic joints are more lax than in males. On examining 532 consecutive reports of cases that I have treated, I find 516 were in females and only 16 in males, or, in other words, about 97 per cent. and 3 per cent. respectively. I may here state, in passing, that in the great majority of cases, contrary to what would be expected, lumbar mal-rotations in young people produce at the time of their occurrence absolutely no symptoms at all, or else merely slight, transient ones; the reason why they are not diagnosed is simply that they are not looked for.

Rotations of the fifth lumbar vertebra, with or without the fourth, can also take place slowly as compensatory to subluxations of the ilium, another pathological entity which is hardly recognised. Indeed, many orthopædic surgeons in this country categorically deny that such displacements ever occur. Yet the sacro-iliac joint, inasmuch as it possesses a fibro-cartilage and a synovial membrane, has all the potentialities of a movable joint and under normal conditions has a certain amount of "give" in it. The question of whether any actual movement can normally take place in it is still under debate, but under abnormal conditions, such as ankylosis of the hip-joint, gliding movement through quite a considerable range can be developed in the sacro-iliac joint as a compensatory element. In any case, displacements of the ilium undoubtedly occur. Some years ago [1] I stated that I had replaced about 1500 of them, and the number has been growing steadily ever since.

These sacro-iliac displacements are nearly always rotary, so that the ilium becomes either depressed or elevated in its anterior portion by movements on a centre situated inside the sacro-iliac joint. The result on the sacrum will be that it will be correspondingly elevated or depressed on that side, and a rotation may slowly arise in the lumbo-sacral joint, whereby the fifth lumbar becomes permanently twisted, in order to bring the sacrum vertical once more.

To estimate the degree of twisting in a mal-rotated lumbar vertebra, ordinary inspection and careful noting of alteration in the bony landmarks of the vertebra and pelvis are sufficient for clinical purposes when performed by the practised eye—but not otherwise. In the absence of such necessary experience, there are several other methods that can be employed, the details of which have already been published by me.[2] In addition one may have recourse to a simple apparatus of my own design, described under the name of the "torsionometer." [3]

[1] Proc. Roy. Soc. Med., 1924, xviii. (Sect. Orthop.); 1925, xxii., 24.

[2] Internat. Jour. Surg., 1922, xxxv., 84.

[3] Brit. Med. Jour., 1924, ii., 958; and THE LANCET, 1924, ii., 1024.

PRIMARY MAL-ROTATIONS CAN BOTH SIMULATE SCOLIOSES AND BE THEIR DIRECT CAUSE

Let it be supposed, for the sake of illustration, that there is a primary mal-rotation of the fifth lumbar vertebra so that its left half moves backwards on the sacrum, and that the remaining lumbar vertebræ maintain their correct relative positions. Now the aforesaid mal-rotation will per se produce a deformity consisting of two component factors: (*a*) deviation of the lumbar vertebræ as a whole, so that their antero-posterior plane forms an acute angle, subtending as many degrees as the one through which the mal-rotation has occurred, to the left with the antero-posterior plane of the body; (*b*) elevation of the left half of the fifth lumbar vertebra because the lumbo-sacral articulation lies at an angle of about 35–40° with the horizontal.

Provided that the position of the pelvis remains unchanged, the deviation of the lumbar vertebræ as a whole to the left will give a false impression that there is a lumbar lateral curve concave to the right. And the greater the amount of concavity present in these lumbar vertebræ the greater will be the amount of apparent scoliosis. Unfortunately skiagrams give the same erroneous impression. In the paper quoted [2] I gave a skiagram, which I venture to say would universally be diagnosed as a case of scoliosis, in which there was mal-rotation through about 19° with no lateral curve at all.

The accuracy of the statement that a mal-rotation can simulate a lateral curvature can be verified by inspecting an ordinary articulated skeleton suspended from its head, always provided that the normal lumbar concavity is reproduced in it. On viewing the said skeleton from behind in its own antero-posterior plane, no rotation or lateral curve can of course be detected. But if the observer stand slightly to one side of the skeleton, a real rotation and an apparent scoliosis will be visible, and these will increase in direct proportion as the angle of observation increases with regard to the antero-posterior plane of the skeleton.

Supposing a subject (or the skeleton mentioned) to have no lumbar concavity at all, then a fifth lumbar mal-rotation would not cause any deviation of the lumbar antero-posterior plane away from that side of the body, and thus no scoliosis would be simulated. This explains why the exercise of "standing trunk bending forwards" will cause a scoliosis simulated by mal-rotation to diminish progressively as the exercise is being performed. It is because, as the exercise proceeds, so the lumbar concavity is progressively diminished until during the final stage of the exercise it is obliterated altogether. The diminution of the apparent lateral curve by this exercise is distinct from the manner in which the latter causes a real scoliosis to be progressively reduced in amount; the latter is effected by a straightening-out of the real lateral curve (possibly with a diminution of the rotation secondary to the latter).

I venture to state that a primary scoliosis in the lumbar region is of rare occurrence and that the greater part of so-called lumbar scolioses are in reality pure mal-rotations or else secondary to them. This may explain why in the former cases the treatment by remedial exercises is so very slow; it is obvious that anteflexion exercises applied in order to correct a lateral curve which does not exist will have but very little effect on the rotary displacement which is the real deformity present. Personally I advise that in every case of lumbar "scoliosis" it

be taken for granted that mal-rotations exist unless the contrary has been definitely proved.

The after-effect of the fifth lumbar mal-rotation may be that it will cause a real scoliosis, and it may do so in either of the following ways: (*a*) In consequence of the deviation of the antero-posterior plane of the lumbar vertebræ to the left, the force of gravity from the weight of the trunk and head will pass to the right of this plane instead of accurately down it, and this unilateral pressure may in the course of time cause permanent thinning of the intervertebral discs on the right side with compensatory increase in thickness on the left side, and thus there may ensue a lateral curve concave to the right. (*b*) The elevation of the left half of the vertebra in question causes the reverse changes in the discs, and a lateral curvature concave to the left may result.

In many cases of fifth lumbar mal-rotation, nature will endeavour to rectify the abnormal position. As spontaneous reposition can very seldom take place, the only alternative is to move the pelvis until the fifth lumbar vertebra is once again moved into its correct site; this is done by depressing the left half of the pelvis and rotating its left half forwards through as many degrees as the lumbar mal-rotation has taken place. This pelvic depression and twist may give the erroneous impression of two distinct deformities: first, that the two legs are of unequal length, and secondly, that one hip is larger than the other.

PRIMARY MAL-ROTATIONS, BEING DISPLACEMENTS, ARE TO BE TREATED AS SUCH

The only rational and scientific treatment for any displacement of a bone is to replace it and then to take any steps that may be necessary in order to ensure that the bone in question will remain in its correct position. It is only when reposition is dangerous or impossible that other palliative measures are to be adopted. This rule, which is followed for displacements in the extremities, is usually totally disregarded when dealing with the vertebral column, though why this should be so I am unable to say. One continually finds statements in text-books and articles that for such vertebral displacements, especially those of the ilium on the sacrum, every form of treatment is recommended (many of which have for their primary object the fixation of the bone in its displaced position) with the one great exception: reposition.

The replacing of primary mal-rotations in the lumbar vertebræ is usually perfectly simple when one has acquired the necessary technique, but I must emphatically state that this takes a very long time to acquire. Spinal manipulation is not a treatment that can be lightly taken up with other forms of therapeutics. I should like to point out that to give a patient a general anæsthetic, as is frequently the custom nowadays, and then to manipulate the vertebral column in every direction in the hope that some bone will move, is a practice that is totally unscientific and ought to be condemned, as it often does a great deal more harm than good.

Unless adhesions are present in the lumbar region, the reposition of lumbar mal-rotations is in the vast majority of cases absolutely painless in the hands of the skilled manipulator. I have performed hundreds of repositions of these bones in children, who have either been somewhat amused when the bone moved or who have not taken the slightest notice of what was being done.

Ordinary uncomplicated mild cases of lumbar mal-rotation can generally be replaced at a single sitting lasting a few minutes. The immediate result, apart from a well-marked sound when the bone moves, is that there ensues an alteration in the bony points that were previously in abnormal relation to one another. Apparent differences in the length of the two legs and apparent differences in the size of the two hips vanish instantaneously when the mal-rotations are corrected. Similarly, simulated scolioses will disappear and real scolioses will show an immediate improvement.

What I have said about rotations in the lumbar vertebræ also applies to those in the dorsal and cervical regions; in the cervical region primary mal-rotations are very much commoner than is usually supposed but space does not permit me to enter into details in this paper.

For further information on many of the points on which I have touched the reader is referred to my previous papers.[4]

[4] Collected Papers on Mechano-therapeutics. London, 1924; Brit. Jour. Radiol., 1924, xxix., 135; Brit. Med. Jour., 1929, ii., 1177, and 1931, i., 919.

CLINICAL AND LABORATORY NOTES

INTUSSUSCEPTION OF THE JEJUNUM

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O. A. Marxer
RADIOGRAPHER, RUTHIN CASTLE, NORTH WALES

Miss A., aged 40, a trained nurse, was admitted to Ruthin Castle on May 21st, 1931. Her medical history was uneventful until a sudden attack of vomiting, followed by an acute pain in the epigastrium, occurred four years before admission. Since then she had had intermittent attacks of pain in the abdomen, to the right of the umbilicus, with nausea and vomiting. A former barium meal having shown a doubtful prepyloric ulcer, a course of ulcer treatment had been given, but her symptoms became worse and an attack of malæna occurred. The pain had been rather more severe and the attacks more frequent for the last few months. It was not related to taking food; vomiting did not relieve it, but alkalis and food occasionally did. There was some loss of weight.

On examination the patient looked well but pale. The circulatory, respiratory, and nervous systems were normal. The tongue showed mild glossitis, and there was a tender spot about half an inch above and to the right of the umbilicus. The blood and urine were normal, and the fæces showed a trace of mucus, but no blood chemically.

The radiographic examination was made with the starch barium meal to show the mucosal relief of the stomach and small bowel. On the X ray table, about one and three-quarter hours after taking a barium meal, a typical attack of pain occurred over the jejunum, to the right of and slightly above the umbilicus (indicated by lead pellet in illustration). A small portion of jejunum, about two feet from the duodeno-jejunal flexure, became elongated and disappeared into the barrel-shaped dilatation distal to it; this followed convulsive movements of the small

intestine, and was accompanied by severe pain and tenderness at the site. Any attempt at manipulation or reduction was impossible owing to pain, but the intussusception released itself spontaneously in about 15 minutes. As regards the other organs, a small diverticulum was seen arising from the posterior œsophageal wall, the appendix and gall-bladder were radiologically normal, the stomach and duodenum were normal except for some coarse rugæ at the cardia. The Figure shows the intussusception, traced and untraced.

Mr. L. R. Braithwaite, of Leeds, operated four weeks later, and found that the first three feet of the small bowel were hypertrophied, with thickened mucous membrane, but there was nothing suggesting intussusception. About three inches from the duodeno-jejunal junction there was an inflamed gland fixed to the small bowel on its antimesenteric border by a dense adhesion. The gland did not appear to be tuberculous. The adhesion was divided and sutured. The first part of the duodenum was adherent to the gastro-colic and gastro-hepatic omenta. There was no ulcer, but some duodenitis present. The appendix was also buried in adhesions and was removed. The adhesions surrounding the duodenum were divided and sutured. The patient made an uninterrupted recovery, and two months after the operation was free from her old symptoms.

Tempo-ary intussusception of jejunum. Barium meal showing strie appearance of stomach and small bowel 1½ hours after ingestion. Note a temporary intussusception of jejunum. The exposure was made during an attack of pain.

The cause of the intussusception was thought to be a polyposis of the jejunum, but Mr. Braithwaite, though he could not eliminate this possibility, was unable to confirm it. He thought the condition was more likely to be a spasmodic one, due to adhesions.

We are indebted to Dr. S. W. Patterson for permission to publish this case, and to Mr. Braithwaite for the details of the operation and subsequent history.

COMMENT BY DR. S. W. PATTERSON

This case presents several points of interest:—

1. As a contribution to the causation of visceral pain the case is not clearly defined, since there were also adhesions around the appendix and adhesions of the jejunum above the site of the intussusception to a gland in the mesentery. It is possible, therefore, that the pain was caused by the inflamed gland, and the spasm of bowel in this situation led to violent movements which resulted in an intussusception. In the absence of other evidence we have no means of deciding that the intussusception was not unique. The recurring attacks of the same character would point to an intermittent inflammation of the gland or a recurring intussusception.

2. Demonstration of intussusception by barium meal has been carried out frequently, and in some instances of acute intussusception in children the reduction has been made by injection of an opaque enema and manipulation while observing the bowel on the X ray table. In cases of chronic intussusception, which usually consist in an entry of the ileum into the cæcum and colon, at times a polyp has been found to lead the intussuscepted bowel.[1] In the present case it was thought that a small polyp might be the cause of the recurrent intussusception. The appearance of acute intussusception of the jejunum resembles the agonal intussusceptions found post mortem. We have not found a record of a similar case.

3. In the absence of demonstrable lesion of stomach, duodenum, and gall-bladder, the patient had been regarded as neurotic, and indeed had almost been persuaded to regard herself as neurotic. The persistent recurrence and localisation of the pain make it likely that the attacks were due to repetition of temporary intussusception. Though probably a rare condition, it affords one more instance of the error of too readily diagnosing a neurosis.

MENINGITIS FOLLOWING FRACTURE OF SKULL

By Bryant W. Knight, M.B. Lond.

HOUSE SURGEON TO THE ROYAL ALEXANDRA HOSPITAL FOR SICK CHILDREN, BRIGHTON

A boy, aged 7, was knocked down by a charabanc on July 23rd, 1931. He was unconscious from the time of injury for four days. He could then be roused sufficiently to take food and to pass urine, but continued to be very drowsy until his admission to the Royal Alexandra Hospital for Sick Children on August 5th.

On examination the child could be roused with difficulty to answer simple questions. There was considerable

[1] Renander, A.: Acta Radiol., March 15th, 1932, p. 65, with literature; Carroll, W. C.: Collected Papers of the Mayo Clinic, 1914, vi., 197; Comfort, M. W.: Ibid., 1930, xxii., 229.

ecchymosis around both eyes, especially the right, together with subconjunctival hæmorrhage in both eyes. There was also a fluctuant swelling over the right eye. This swelling was aspirated and about 10 c.cm. of straw-coloured fluid was obtained, which was found to be cerebro-spinal fluid containing numerous red blood corpuscles. On culture this fluid was sterile. After aspiration a crack about one-quarter inch wide could be felt, extending from the right orbital margin upwards for 2 to 3 inches into the frontal bone. This fracture was confirmed by radiography, but no extension into the base of the skull could be seen.

The child made a steady recovery. The swelling in the right frontal region completely disappeared in four weeks, and he was discharged from the hospital on Oct. 19th, 1931—an apparently healthy child except for the palpable fracture of the right frontal region.

He appeared to remain in good health until Jan. 22nd, 1932, when he suddenly "fainted" whilst sitting at table. He remained unconscious about three minutes. Two hours later he complained of intense headache and vomited.

On Jan. 23rd he was readmitted to hospital in a stuporous condition with a temperature of 103·8° F., and a pulse-rate of 128. There was a definite rigidity of the neck muscles and a positive Kernig's sign. Lumbar puncture revealed a turbid cerebro-spinal fluid under increased pressure, which on examination showed Gram-positive diplococci. On the 24th there was again a definite swelling obscuring the fracture line in the right frontal region. Under local anæsthesia a fine rubber catheter was inserted into the spinal canal, using a trocar and cannula to introduce it. Pneumococci were grown from the C.S.F. obtained on this occasion. About an hour after insertion of the catheter the swelling of the right frontal region had completely disappeared, and the fracture line was again palpable with ease. The child grew steadily worse and died on Jan. 27th.

Post-mortem examination revealed a fissured fracture extending from the right frontal region into the region of the cribriform plate of the ethmoid, which could not be identified, leaving a communication three-eighths inch wide with the right superior meatus of the nose. The meninges were closely adherent along the line of the fracture, and there was an abscess in the right frontal lobe of the cerebrum, immediately above the region of the cribriform plate. The right lateral ventricle communicated with the abscess cavity, and all the ventricles were full of pus. There was a generalised meningitis, most marked around the fourth ventricle.

The chief interest of this case lies in the long latent period (six months) between the original injury and the first indication of intracranial sepsis. How soon after the injury the infection found its way from the nose through the gap in the floor of the anterior fossa into the cerebrum is a matter for speculation. Presumably there had been an abscess forming in the frontal lobe for a considerable time, which on Jan. 22nd burst into the right lateral ventricle and thence followed the course of the normal C.S.F. circulation to arrive at the base of the brain, with the resultant generalised meningitis. That such a sequence of events might take place equally well, when a fracture could not be detected by the usual clinical examination, demands that a careful inquiry into any history of previous injuries should be made.

I am indebted to Mr. St. G. Delisle Gray for permission to publish this case.

TUBERCULOSIS IN NORTH WALES.—At the annual meeting of the board of governors of the King Edward VII National Memorial Association, Lord Davies, the president, announced that a special investigation into the high incidence of tuberculosis in certain areas of North Wales has now been begun. It is hoped that the inquiry will be completed in time for some definite conclusions to be submitted to the governors next year. With the view of bringing about a reduction of the long list of patients awaiting admission to the Association's institutions, it has been decided to rent additional beds in outside hospitals, and in the estimates for the current year £16,170 has been set aside for this purpose.

BRITISH MEDICAL ASSOCIATION

CENTENARY MEETING IN LONDON

SECTION OF NEUROLOGY

AT the opening meeting of this section, the President, Sir FARQUHAR BUZZARD, being in the chair, a discussion on the ætiology and symptomatology of

Disseminated Sclerosis

was opened by Dr. W. J. ADIE (London). For the purpose of his contribution, he said, two groups of cases had been studied—70 cases of acute retrobulbar neuritis and 118 cases of disseminated sclerosis. Although it was now recognised that many of the reported cases of hereditary and familial disseminated sclerosis were examples of other disorders, it was certain that genuine familial cases did occur. It was usually stated that males were more often affected than females—in the proportion of three to two—but fresh statistics upon this point as well as on other differences in the manifestations of the disease in other countries would provide interesting and important information. Despite much investigation, the ætiological and even the pathological nature of the disease was still in doubt. The modern tendency had, he said, been rather to emphasise the frequency of an insidious onset, but if the onset of the disease was taken as the appearance of the first symptom then it was always sudden. Among the earlier symptoms were paræsthesia, transitory ocular troubles, and disturbances of gait. Acute retrobulbar neuritis was also very frequently the first manifestation. All writers had emphasised the importance in diagnosis of a history of relapses and remissions. The course was discontinuous in every case in Dr. Adie's series. The age of onset was in the third or fourth decade in 74·5 per cent. of the cases, the earliest age of onset being 12 years. The duration of the disease was said to range from a few months to 20 or 30 years. When the significance of acute retrobulbar neuritis and other characteristic early symptoms was better known, a lower figure would be given for the average age of onset and a higher figure for the average duration of the disease. Very long remissions up to 20 years and more were not uncommon when retrobulbar neuritis was the first symptom, but remissions approaching this in length were not common after other modes of onset.

There were, Dr. Adie remarked, many remarkable variations, both in symptoms and signs, that occurred quite spontaneously, a fact that rendered it difficult to assess the value of any particular form of new treatment. The incidence of nystagmus in the disease was high; nevertheless, it was frequently absent, especially in the early stages. Paresis of an ocular muscle sufficient to cause diplopia was very common. As a working rule it might be said that a persistent gross ocular palsy in a patient otherwise free from symptoms was not due to disseminated sclerosis. Alterations in the pupils, apart from the transient effects of acute retrobulbar neuritis, were also rare. In Dr. Adie's series of 118 cases a clear history of a severe attack of acute retrobulbar neuritis was obtained in 41. In 20 of these it was the first symptom that the patient could remember, and in every instance it was an early symptom. It seemed, therefore, as if an attack of retrobulbar neuritis rarely occurred after the disease was firmly established. It was well known that an attack of retrobulbar neuritis might precede other symptoms of disseminated sclerosis by many years. Simultaneous and early consecutive attacks in both eyes were very rare. For the present purpose

Dr. Adie reserved the term "acute retrobulbar neuritis" for cases characterised by (1) acute onset, (2) unilateral incidence, (3) central scotoma, and (4) tendency to recovery. The visual defect was almost always most intense in the central area of the field. As a rule recovery began within a week or two, and by the end of six weeks or two months was often considered by the patient to be complete.

Dr. Adie invited discussion on two statements: (1) disseminated sclerosis was the only known common cause of acute unilateral retrobulbar neuritis as here defined; (2) apart from certain rare allied acute inflammatory diseases of the nervous system it was the only cause.

Dr. D. McALPINE (London) said that the characteristic histological feature of disseminated sclerosis was the presence of areas of demyelination or destruction of myelin sheaths. Within the last few years a number of other conditions had been described in which a similar patchy loss of myelin sheaths occurred. The commonest of these was undoubtedly acute disseminated encephalomyelitis. This condition came into prominence as a sequel to vaccination, but subsequently similar cases were reported following measles and other infectious fevers. Of more importance clinically were the cases that arose spontaneously. The clinical picture might closely resemble acute cases of disseminated sclerosis. Also, the close similarity, histologically, between these two conditions had led some observers to consider acute disseminated encephalomyelitis as merely an acute form of disseminated sclerosis. Dr. McAlpine favoured the view of Redlich and others, who held that certain of these cases were examples of acute disseminated encephalomyelitis, and that when the initial phase passed off, sometimes with complete recovery, no further relapse need be expected in contrast to the unhappy course of disseminated sclerosis. This problem, obviously of considerable clinical importance, was difficult to prove at the present time, owing to the well-known length of remissions that might occur in disseminated sclerosis. More convincing proof that we are dealing with two separate diseases was afforded by certain clinical features that seemed distinctive of acute disseminated encephalomyelitis.

(1) The age of the patient—acute disseminated encephalomyelitis might occur at any age; disseminated sclerosis was exceedingly rare before the age of 16.

(2) The occurrence of fever—if the temperature was above 100°, then disseminated sclerosis was most unlikely.

(3) Pains which might be severe were usually present in the spinal form. Pain seldom occurred in disseminated sclerosis and was not severe.

(4) The deep reflexes might be diminished or lost.

(5) Sensory loss, when present, tended to affect thermal sensibility more than posterior column sense; the reverse was the case in disseminated sclerosis.

(6) Loss of vision was uncommon; when it occurred both eyes were generally affected.

(7) The cerebro-spinal fluid was frequently normal in acute disseminated encephalomyelitis.

When more than one of these points was present in a case, Dr. McAlpine thought that a diagnosis of acute disseminated encephalomyelitis rather than disseminated sclerosis was justified.

Dr. J. S. COLLIER (London) commented upon the household incidence of the malady as opposed to the familial incidence. He had on three occasions observed two young males entirely unrelated, but who had been brought up in the same household together, stricken with this disease within a year or two. The obvious suggestion was that these three pairs were exposed to the same environment and the same infection. But, lest it should be thought that he was arguing that all the familial cases were to be explained in this way, he gave the example of a mother and two daughters who were afflicted by this disease. The mother died young and when her daughters were infants. The family removed to fresh surroundings, the two sisters not even seeing one another during the 15 years preceding the onset of symptoms in the younger one; therefore, if there was any infection in these three people it must have been instilled at a very early date and many years before the appearance of symptoms. Disseminated sclerosis would be a strange infective disease, not proving rapidly fatal, if the infection was not now and then conquered by the natural bodily resources. It was generally believed that disseminated sclerosis did sometimes heal finally. He gave instances that had occurred in his experiences. One of the striking clinical features of this disease was that some of its most signal symptoms occurred only during the early stage and never during the subsequent stages, that they never persisted, and that the lesions productive of these symptoms did not produce neuronic destruction or permanent loss of function—e.g., retrobulbar neuritis and ophthalmoplegia. From the rapidity with which these symptoms occurred, he was in the habit of teaching that they were due to an acute œdema in the affected patch occurring in the course of the pathological process, and which was followed by demyelination but not by axonic destruction. Dr. Collier wished to draw the attention of this meeting to the destructibility and permanent abrogation of function of some only of the nerve elements by disseminated sclerosis. He suggested that the permanent symptoms of disseminated sclerosis were determined by the greater vulnerability of phylogenetically recent elements of the human nervous system.

Dr. R. S. ALLISON (Belfast) commented upon the incidence of the disease in Ireland. The only frequent feature in the large majority of the cases he had investigated in Ireland and Wales—130 altogether—was that they obtained their drinking water from spring wells. There appeared to be a distinct resemblance between the geographic distribution of disseminated sclerosis and goitre; the link between the two diseases might be drinking water, the importance of which had already been established in endemic goitre. Dr. Allison also referred to the physical and mental background of cases of the disease. The majority of the patients were dark haired, of thin asthenic build, and inclined to be tall in stature. Of 42 cases in which the past history had been investigated closely, abnormalities in the personality, sensory, and motor disturbances were present in childhood, and some time before accepted date of onset in one third of the cases. In these cases the onset of the disease appeared to be rather the unmasking of a latent process or diathesis than the onset of a new disease, as in the following examples:—

Female.—Paternal grandfather died, stroke, aged 53; maternal grandfather had paralysis agitans, and an aunt was epileptic. Patient is third in family of five, and had always given parents anxiety. "Not like the other children. Easily the most nervous, sensitive, and shy. Frequently burst into tears, but if humoured, happy and light-hearted. As a child easily frightened, and would shake all over at sudden noise." Aged 20: paræsthesia right leg, spastic weakness, recovery. 22: "Sight blurred for three months." 23: Right leg weak, depressed. 24: "Sudden blindness," recovery. 25: *Examination*—Euphoria; intention tremor right arm; pallor of discs; spastic paresis right leg; blood and C.S.F. negative.

Male.—Aged 2: "Small and quite unable to walk." Gradually learned, but very slowly, and was never able to walk like other boys. 5–14: At school: "Quiet, reserved, average intelligence, but ambitious and quick-witted. Could only run slowly and with unusual 'hopping gait.'" Did not

join in games. Frequently absent from school owing to illness. "Stomach always upset and forever had the cold." 19: severe pain right arm. Off work several weeks till "cured by rubbing." 26: Influenza, followed by stiffness and weakness left leg. "Could scarcely walk at all, but this gradually improved." 27: *Examination*—Euphoria; spastic hemiparesis left side; intention tremor marked; plantars extensor; abdominals absent; blood and C.S.F. negative.

Dr. C. WORSTER-DROUGHT (London) agreed that genuine familial cases did occur, and said that for some three or four years he had been investigating this aspect. It was admittedly very difficult to distinguish cases of familial disseminated sclerosis from some of the more unusual forms of heredito-familial ataxia. Both diseases were protean in their manifestations, and had most physical signs in common. He had reached the conclusion that only three features could be relied upon to distinguish one disease from the other: (1) the presence at some time during the course of an acute retrobulbar neuritis, (2) the occurrence of definite remissions, and (3) the presence in the cerebro-spinal fluid of a Lange curve of paretic type. These three features occurred in disseminated sclerosis and not in heredito-familial ataxia. He drew attention to the occasional occurrence of mental disturbance as an initial symptom. The mental disturbance was usually one of hypomania of confusion. Dr. Worster-Drought was quite sure an Argyll Robertson pupil might occur in disseminated sclerosis, and he had at different times shown examples of this sign occurring unilaterally in disseminated sclerosis. He also commented upon the additional help in diagnosis afforded by taking a speech record according to the method described by E. W. Scripture. For some time he had been investigating this sign of the disease, and had confirmed the fact that a very high percentage of cases showed characteristic ataxia in the speech tracing. It was, in fact, a delicate test for ataxia of the vocal muscles. It appeared absent only in those cases with an exclusively spinal cord distribution. Another point was the exceedingly great value of cerebro-spinal fluid examination, not only in the differential diagnosis but also in the actual diagnosis of disseminated sclerosis, and especially the importance of the Lange reaction. With constant and careful methods he considered that a curve of the paretic type could be obtained very frequently in early cases and even in cases of acute retrobulbar neuritis. In long-standing cases, in those comparatively quiescent and in those with an almost exclusive spinal cord distribution, a curve of the luetic type might be found.

Dr. C. P. SYMONDS (London) had analysed 171 cases of undoubted disseminated sclerosis that had come under his observation. 34·7 per cent. of these were males and 65·3 per cent. females. As regards the first symptom, investigation showed the following: (1) sensory or motor disturbance in lower limbs, 42 per cent.; ocular symptoms, 25 per cent.; sensory or motor disturbances in upper limbs, 11 per cent.; homolateral affection of upper and lower limbs, 6 per cent.; vertigo, 4 per cent.; sensory or motor disturbance of face, 3 per cent. The most frequent age of onset was between 21 and 30 years (37 per cent.), the next, 31–40 years (30 per cent.). Despite the utmost care in eliciting histories, he believed the age of onset in many of these cases to be earlier than recorded. Early symptoms might be slight, and remission might be so long that the earlier symptoms were forgotten. Occasionally some last moment admission might carry the history back several years. Also he had little doubt of the occurrence of cases with an onset in the fifth and occasionally sixth decade. Among the more uncommon symptoms in Dr. Symonds's series were attacks of generalised tremor, herpes, and episodic mental disturbances. A definite history of retrobulbar neuritis had occurred in 41 patients (24 per cent. of the series), and in 8 of these the condition was bilateral. In 16 per cent. of all cases retrobulbar neuritis was the first symptom. The speaker was inclined to agree with those who regarded "neuromyelitis optica of Devic" as an acute variant of disseminated sclerosis. Neither on the pathological nor on the clinical side could he see any line of distinction.

Dr. F. R. FERGUSON (Manchester) referred to the problem of disseminated sclerosis in old age and the frequency with which the disease commenced after 45. Broadly speaking, there were two groups: (*a*) where the disease commenced in early life and yet the patients lived on till 60 or 70; and (*b*) where the disease commenced in the late forties or early fifties. Although it was incontrovertibly established that the age of onset of at least 70 per cent. of the cases of disseminated sclerosis was between 20 and 40, yet, on the other hand, there were a sufficient number on either side of these ages to demand attention. The statistics from the literature varied, but about 20–25 per cent. commenced after 40. From a review of 743 cases from the National Hospital, Queen-square, diagnosed as disseminated sclerosis, no fewer than 92, or 12 per cent., were over 50, and 10 over 60 at the time of discharge. It was notoriously difficult to follow up and prove the diagnosis in these cases, but one could not help being struck very forcibly by these figures. The clinical and post-mortem findings in 29 cases at the National Hospital were analysed, and it was found that in no fewer than 12 the patient was over 40 when the disease commenced, and 8 of the patients were over 50 at the date of death. The figures were small but significant. Dr. Ferguson showed microphotographs of typical sections of two cases in which the age of onset had been 55 and 56 respectively, and recorded two cases, aged 76 and 67, in which the disease had been in existence for 40 and 42 years. There was no essential difference in type noticed clinically or pathologically, whether the disease commenced early or late.

Dr. R. B. HALLEY STEWART (London) criticised the claim made by Miss Chevassut that the organism responsible for disseminated sclerosis was a virus which had been termed spherula insularis. He described his experiences and observations over a period of some months at the Halley Stewart Institute.

Dr. J. LE F. BURROW (Leeds) laid stress on defective statistics of early symptoms, particularly eye symptoms, compiled in large hospitals. The infective ætiology was discussed, and the theory developed that, owing to the impermeability of meninges, antibodies in the blood did not penetrate into intercellular spaces in the central nervous system. The measures most suited for treatment, therefore, would be those tending to increase permeability of the meninges. In Dr. Burrow's experience, the method of treatment found of most value was the intravenous injection of novarsenobillon, followed by drainage of cerebro-spinal fluid by lumbar puncture and the injection of the patient's own serum. To increase the penetration of possible antibodies the intravenous injection of hypertonic saline was carried out at the same time, and the foot of the bed kept raised for several hours.

Dr. MACDONALD CRITCHLEY (London) dealt with the incidence of familial examples of the disease, and referred to the presence of psychopathic tendencies

in other members of such families. He mentioned a case of typical disseminated sclerosis occurring in a girl whose father also had had the disease. Both this girl's paternal uncle and aunt were in institutions suffering from depressive psychoses, and their mother also had died in a mental hospital. The speaker considered that there was an important endogenous aspect in addition to the possible element of infection. In his view, disseminated sclerosis occurred in such families more frequently than could be accounted for by mere chance. Careful investigation of the family histories of patients would reveal psychopathic histories in other members of the family more often than in normal families. Also in the early childhood of many patients there might be discovered something peculiar and suggestive. Finally, there might be a constitutional habitus on physical investigation.

Dr. W. RUSSELL BRAIN (London) agreed that acute retrobulbar neuritis was usually due to disseminated sclerosis; there were, however, exceptions. It might occur in connexion with neurosyphilis in addition to neuromyelitis optica of Devic. He described cases of acute unilateral retrobulbar neuritis without signs of involvement of other parts of the nervous system. These he regarded as a variant of neuromyelitis optica, and pointed out that recovery of vision was much less complete than was usual in the retrobulbar neuritis of disseminated sclerosis. He also drew attention to the occurrence of disturbances of the autonomic nervous system in disseminated sclerosis, and mentioned acute ascending myelitis as an unusual mode of termination in this disease.

SECTION OF BACTERIOLOGY

THE first meeting of this section was devoted to a discussion on the immunological basis of

Prophylactic Inoculation against Bacterial Diseases

Sir ALMROTH WRIGHT, the president, discussed the ways in which Pasteur's original ten postulates had become untenable by modern immunologists. A live vaccine was not considered necessary for the production of immunity. The effect of a few vaccines appeared to be not strictly specific, but to give protection against another unrelated disease. The speaker doubted whether the value of immunising procedures was best assessed by statistical methods, although the alternative methods of measuring antigens, agglutinins, and bacteriolytic substances were beset with difficulties.

Prof. MAJOR GREENWOOD (London School of Hygiene) said that among the commoner infectious diseases there were at one end of the scale some such as small-pox, measles, and typhoid fever, which rarely attacked a person more than once; at the other end coughs, colds, and "influenza," which might and did attack the same person over and over again. The first group, thanks to Jenner and Sir Almroth Wright, had furnished the most conspicuous triumphs of artificial pre-immunisation, the contrasting group with the most conspicuous failures of the method. In collaboration with Prof. W. W. C. Topley, Prof. Greenwood had compared the course of mortality in herds of mice, one herd being infected with pasteurella, an infection analogous to coughs and colds, the other with ectromelia, an infection analogous to measles. In both the rate of mortality during the first few days of exposure in the infected herd was low, in both it then increased to a maximum and then declined. But while in the ectromelia herd this decline brought the rate of mortality down to that experienced by mice not exposed to any infection, in the pasteurella herd the decline left the rate of mortality far above that of normal mortality; mice which had survived continued to die of pasteurellosis—not at so high a rate as new immigrants, but at a rate high enough to place them in a position substantially worse than that of normal mice. Similar results to those found in pasteurellosis were found in other herds infected with *Bacillus aertrycke*; the specific mortality of survivors never fell to the level of normal mortality. But even when the herd had been recruited wholly from mice which had been pre-immunised by a method which, judged by the usual laboratory criteria, was very efficient, the ultimate mortality remained high. It seemed here that although pre-immunisation was a valuable prophylactic against a relatively short intense exposure to infection, it could not be relied upon to end a herd sickness. There was apparently a critical upper limit to the degree of practical immunisation to be attained by methods similar to those employed in human herds; given the maintenance of a sufficiently unfavourable environment the herd disease was bound to continue. From this the speaker concluded that it is wiser, where possible, to improve an environment than to try to make the herd insensitive to that environment. He doubted whether, if the President's efficient and relatively cheap method of pre-immunisation against diseases of the enteric group had been available 80 years ago, many lives on the balance would have been saved, since neither private property holders nor public authorities would have been persuaded to undertake the costly reconstruction of water-supplies and drainage systems.

Dr. J. A. ARKWRIGHT (Lister Institute) said that one bacterium could contain several different antigens, to each of which an appropriate antibody was formed; such distinct antigens might, for instance, be a toxin, a flagella system, a capsule or a mucilaginous envelope. Prophylactic vaccines, therefore, should contain the antigens to which antibodies were desired, and should be made from virulent strains or toxigenic cultures. Since antigens were often definite chemical substances which would survive the death of the bacterium, it was not always necessary for the vaccines to be alive.

Mr. A. FELIX, D.Sc. (Lister Institute), discussed the different rôles in immunity of the antigens mentioned by Dr. Arkwright. It had been possible to differentiate two antigens in relation to flagellated bacteria. Of these the smooth somatic antigen (O) with its corresponding antibody had been found to be the sole important factor in active and passive immunity to *B. typhosus* and other members of the salmonella group. Although the pathogenicity of this group apparently depended on the smooth O group, and more particularly on its specific carbohydrate component, there must be also some inherited factor which would account for the different pathogenic actions of, say, *B. typhosus* and *B. enteritidis*, whose O antigens appeared to be identical. The same factor apparently determined the reappearance of the specific H antigen whenever reversion from the non-motile O form to the motile H form occurred, since transformation of one of these species into another had not been established. The biological function of the H antigen remained to-day as obscure as it had been ten years ago.

Lieut.-Colonel H. MARRIAN PERRY, R.A.M.C., said that the success of the army vaccines in immunising against typhoid and paratyphoid fevers in a field was beyond doubt. The Army Pathology Directorate

had to consider whether, in view of the recent knowledge of antigens, a modified vaccine of greater efficiency could be employed. The custom for many years had been to ensure by continual colony selection that organisms in the smooth phase only were included in the army typhoid vaccine. It was felt that certain findings of laboratory experiments required further proof before the present form of vaccine should be altered. The Army Medical Services would take an early opportunity to try out, by the ultimate test of field experiment in endemic areas of the disease, modifications of the vaccine when they were satisfied that a product at least as effective as the old vaccine were available.

A paper by Prof. T. MADSEN (Copenhagen) on vaccination against whooping-cough was read by Dr. Moltke. The Bordet-Gengou bacillus, he said, could be identified as the whooping-cough bacillus; the results obtained at the different whooping-cough diagnostic stations in Denmark, and the complement fixation reaction demonstrable during the natural illness and after vaccination, all led to this conclusion. The reactions following injections were usually insignificant, but it was considered advisable not to undertake vaccination of children under one month of age. The conclusions drawn from extensive use (with control groups) of the vaccine were that the illness was not generally prevented, but if the vaccine were given a week or more before the onset of the disease the mortality was greatly reduced. The disease in vaccinated individuals took a much milder course, and was of shorter duration.

Dr. H. L. SCHÜTZE (Lister Institute), in a paper read by Prof. J. C. G. Ledingham, described how recent knowledge of individual antigens could be applied to increase the potency of prophylactic vaccines. It was necessary for a pneumococcus vaccine to be prepared from a virulent culture, since the capsule found alone in virulent cocci was responsible for the effective antigen. Similarly, for the salmonellas the same type of antigen possessed alone by a smooth culture was required to produce a potent killed vaccine. The efficacy of plague vaccine was associated with a heat-labile antigen present in the gelatinous envelope which developed round the bacterium when grown at a comparatively high temperature (37° C.). There was some evidence to show that even the rough soma was capable of protecting when given in increased amount, as presumably happened when a living vaccine multiplied in the animal body.

Dr. RONALD HARE (London) had found it possible to immunise rabbits against hæmolytic streptococci by means of heat-killed, washed, homologous cocci. For this purpose the injected cocci had to be derived from a virulent strain, so it was unlikely that agglutinins, which can be produced equally by avirulent cultures, were responsible for the production of solid immunity. Antibodies, whose function it was to bring about destruction of organisms by means of phagocytosis, appeared after these inoculations. Although it was not clear that these antibodies were the chief factor in the immunity, it seemed certain that antibodies which facilitated phagocytosis of virulent organisms must be of some value to their possessor. Repeated doses were necessary to procure immunity to hæmolytic streptococci.

Mr. THOMAS DALLING, M.R.C.V.S., described the method in wide use of active immunisation against lamb dysentery. For this purpose a formolised full culture of the causal bacillus (*B. agni*) was used. The protection of the lamb was given through the mother sheep, by inoculation once before conception and once just before lambing. The lamb at birth was in no way immune, but the high concentration of lamb dysentery antitoxin in the mother's colostrum in the first few days was sufficient to give entire protection to the lamb.

Dr. H. B. DAY (London) had been able to obtain a vaccine conferring species immunity to pneumococcal infections of each of the four types; the vaccine was as potent as each of the separate type-specific vaccines to its type. It was well known that to obtain the type-specific antigen it was necessary to extract a young virulent culture with acid; the species antigen could be extracted with alkali from a mature culture about to undergo autolysis. The appearance of the species antigen was accompanied by a disappearance of the type-specific antigen. Dr. Day described experiments which made him believe that the species antigen was derived from the type-specific.

The PRESIDENT said that, rather than sum up, he would in conclusion mention a few points which had occurred to him. He wondered why the particular constituent of a virulent microbe had to be present in a vaccine. He considered that dosage was all-important in the therapeutic use of vaccines. Too little attention had been paid to non-specific immunity; there was some chance that such immunity might be attainable to many if not to all organisms.

SECTION OF DERMATOLOGY AND VENEREAL DISEASES

AT a meeting of this section, held on July 27th, the chair was taken by the President, Dr. H. W. BARBER, who read, on behalf of Dr. R. CRANSTON LOW (Edinburgh), a paper on the uses of

Non-specific Protein Therapy

There were, he said, many indications that there was not a specific reaction corresponding with every infection; in the infectious fevers, for example, there was a common factor and a specific factor, and the former was the more important therapeutically in an early stage before the toxins had fully developed. Non-specific therapy was used to assist the reactions common to all infections, and so to enable the individual to desensitise or immunise himself. It was based on rational and scientific foundations. A large number of substances had been used: (1) blood and serum—normal, antitoxic, or from blisters, pleural effusions, joints, and cerebro-spinal fluid; (2) milk and its preparations; (3) tissue extracts, human and animal; (4) vegetable and seed extracts; (5) bacterial proteins; (6) split proteins; (7) chemicals for fixation abscess; (8) artificially induced diseases such as malaria. Possibly also drugs like mercury, iodides, arsenicals, and colloid metals might act by breaking down inflammatory tissues with a resulting protein absorption. Indirect protein therapy might be produced also by X rays, radium, cauterisation, diathermy, freezing with carbon dioxide snow, ultra-violet light, cupping, and Bier's congestion. Many routes had been used to introduce the non-specific agent. The dose must be enough to cause a moderate general reaction.

Non-specific therapy was sometimes very useful in urticaria and angioneurotic œdema where a cause could not be found, and had on the whole worked fairly satisfactorily in eczema and dermatitis, in which turpentine seemed to give just as good results as auto-sero- or auto-hæmotherapy. There were few records of the treatment of infantile eczema; Dr. Low himself had had no success. There were only two records of dermatitis of external origin,

both successes. Light dermatitis (adult group) had been cured by peptone; apparently the desensitisation lasted about two years. Good results had been recorded in neurodermatitis—general and local pruritus—with auto-sero- and auto-hæmotherapy, milk, and turpentine. Herpes gestationis and two cases of general exfoliative dermatitis had given good results, and some cases of pemphigus had been astonishingly benefited. A brief improvement only had been obtained in dermatitis herpetiformis. In psoriasis the therapy probably only increased the susceptibility to local treatment. Encouraging results had been obtained in lichen planus, staphylococcal, and streptococcal infections, ringworm, and both kinds of lupus. Syphilis was also benefited, and in the late stages—neurosyphilis—the results were striking.

Non-specific therapy therefore had a very wide field of usefulness in conditions in which sensitisation occurred. There was a certain danger of anaphylactic shock, and contra-indications were alcoholism, chronic myocardial changes, and advanced arterio-sclerosis. The treatment should be given before the powers of reaction were exhausted, and cases of pulmonary disease might show focal reactions. The best results were obtained when non-specific therapy was combined with other methods. The exact form of protein used was not important.

Dr. HENRY MACCORMAC (London) said that the limitations and applications of non-specific protein therapy could conveniently be classified in three groups: parasitic, allergic, and a group in which the allergic nature had not been established. In the parasitic group he mentioned whole-blood injections for furunculosis, and intradermal injections of mixed stock vaccine for sycosis. The allergic group could be recognised by the fact that the eruption was symmetrical, with diffuse margins, and polymorphous with some degree of œdema. Peptone now had a definite place in the treatment of urticaria and eczema. In the latter, local treatment was also essential, and a febrile reaction should not be produced by the protein. Psoriasis, on the other hand, was most likely to respond to a febrile reaction, but the results of non-specific therapy were not very good. The success of protein therapy might, with advantage, raise suspicions of the specificity of other methods, such as vaccines.

Dr. NORMAN BURGESS (Bristol) described some clinical and experimental investigations on auto-hæmotherapy and auto-serotherapy. Psoriasis, varicose dermatitis with generalised sensitisation rash, toxic erythema, eczema, chronic urticaria, and furunculosis had yielded to this method of treatment, which was probably specific. Nummular eczema had improved in one case out of four. Whole-blood injections did not affect the leucocyte count, the hæmoclastic crisis, or the sedimentation rate. The underlying mechanism of the method had been studied by means of the urinary proteose. Only a very small proportion of normal persons, but over half the sufferers from skin diseases, gave positive reactions to their own proteoses. The acute cases of psoriasis gave the greatest proportion of positive reactions, and derived the greatest benefit from auto-hæmotherapy. After treatment the reactions to proteose of previously positive cases became negative, though some cases still gave a positive reaction to peptone.

Dr. J. T. INGRAM (Leeds) did not accept the view that non-specific therapy was entirely rational and scientific. He thought it was in fact a "shock" therapy. In the main it benefited disorders of function rather than diseases, conditions in which it shook up "bad habits," much as judicious "shock therapy" might benefit a naughty child. There seemed a great deal of evidence in favour of regarding auto-hæmotherapy as specific. Its results were in some cases dramatically successful without the ordinary constitutional accompaniments of shock therapy; in another group of cases the results were vague, and more resembled the results of non-specific therapy generally. It was rather surprising that more was not heard of anaphylaxis if it was such a real danger.

DISCUSSION

Dr. G. MILIAN (Paris) cited, as examples of non-specific therapy, the cure, many years ago, of tuberculous adenopathies with secondary syphilis by anti-syphilitic remedies, although uncomplicated cases were not benefited by mercury. Mixed secondary and tertiary chancres (soft chancre complicated by syphilis) could also be cured by mercury; and gout by 914—a method of treatment called heterotherapy which since 1920 had been used especially in the treatment of general paralysis. It was not the malaria that cured the paralysis, but the anti-malaria treatment.

Dr. H. D. HALDIN-DAVIS (London) described a case of exfoliative dermatitis which he had treated in vain with T.A.B., but which had cleared up after a severe broncho-pneumonic attack. He did not agree that fever should be avoided in eczematous cases. Psoriasis seemed quite impervious to non-specific therapy.

Dr. J. E. WIGLEY (London) agreed that a rise of temperature was desirable; he had only obtained benefit in chronic eczema if the fever rose considerably, and even then the benefit was temporary. He cited a case of leprosy whose disease had been arrested by the febrile reactions produced by injections of carefully distilled water, in the course of an experiment some years ago.

Dr. MACCORMAC asked what "scientific" medicine was; if patients were benefited they did not mind how unscientific the treatment was.

Dr. J. F. BURGESS (Montreal) read a paper on

Quinine Desensitisation

He described investigations into dermatitis resulting from use of a lotion containing 0·5 per cent. of quinine. The patients had had no previous idiosyncrasy, but developed sensitiveness after repeated contact for periods of from two weeks to a year. The eruptions were erythematous in type; allergic types of reaction were sometimes manifested later, after longer exposure. Patients had been desensitised by gradually increasing doses of quinine, by mouth in one case, and intramuscularly in another.

Dr. MACCORMAC spoke of cases of atropine sensitiveness, which might not be accompanied by any general allergy. Treatment by desensitisation had not proved successful so far.

The PRESIDENT asked if any member had seen cases of local or general dermatitis as a result of the use of contraceptives. He had recently seen an acute dermatitis of the neck and vulva with slight eczematisation of the limbs. The patient had severe hæmorrhoids, to which she attributed her condition, but the nurse had at once ascribed it to contraceptives—presumably containing quinine.

Dr. GLADYS SANDES (London) quoted two cases; in one the whole vagina had exfoliated, and there had been patches on the back of the neck in a woman who had used "extra strong" quinine pessaries.

About four months later the same pessaries had produced the same effect again. In the other case quinine ointment used with a Dutch cap had produced the condition.

Dr. MACCORMAC mentioned eruptions on the male genitals from the use of quinine pessaries, and quoted one case in a woman.

Dr. A. C. ROXBURGH (London) said that he had also seen cases in women.

Dr. S. E. DORE (London) said that quinine mixtures in eczema and mild urticaria had in his experience proved very beneficial.

Dr. INGRAM quoted a case in a boy of 7, whose father and maternal grandmother also suffered. He had epilated with X rays, with temporary improvement.

Dr. A. R. HALLAM (Sheffield) read a paper on

Recurrent Boils

He said that the sufferer from boils was apt to be regarded with some levity, though those who had experienced them remembered that Satan had afflicted Job with this malady. Probably, boils caused more deaths than any other skin complaint. The development of a boil depended on the balance of dose of cocci against the resistance. Most people at some time or another carried the *Staphylococcus aureus*. The age of greatest vigour seemed to be the period most liable to boils: the second, third, and fourth decades. Trauma played a part in this selection, but many sedentary workers also suffered. Women were very much less liable than men; the female skin seemed to be a less suitable habitat for the staphylococcus. In some people the follicles seemed to have a lowered resistance. Glycosuria was very rare, but many patients confessed to eating large quantities of sweets. A drastic reduction in carbohydrates was of value in treatment. A more important ætiological factor was the coexistence of some skin lesion which might act as a focus of infection. Large fomentations carried the infection to neighbouring follicles, and wet dressings should be cut down as much as possible. The self-disinfecting power of the skin seemed to depend very much on its dryness. The fomentation gave relief but was a frequent source of recurrence. He advised bathing widely with methylated spirits, and spirit compresses on the boils. Many remedies had been sponsored. Fresh yeast had been regarded abroad as a specific, but similar success had not been obtained in this country. The remedies introduced by Mr. McDonagh were of value, particularly the manganese hydroxide. Some success might follow early abortive treatment, but was not the rule. The prophylactic measures against reinfection were of more importance than any treatment of the developed boil.

Dr. MILIAN said that boils were a very rare complication of scabies in Paris, but were commonly accompanied by pediculosis. Scabies was accompanied by a streptococcus, though there was an impetiginous type. Experiments had shown that the cutaneous flora multiplied astonishingly after a bath; this was on account of the humidity. For a bath to be disinfectant it must be accompanied by an antiseptic (such as soap or permanganate of potash), and followed by a drying agent, such as eau de Cologne friction. An excellent internal treatment for boils was phosphoric acid; 15 drops a day should be taken for a year in chronic cases, or in acute cases intravenous gallyl could be given, and gave dramatic relief.

Dr. J. M. H. MACLEOD pointed out the frequency of boils in the neck, possibly fostered by the use of infected clippers. Boils were associated with some defect in the general health. A reduction of carbohydrates undoubtedly brought about considerable improvement. Pruritus ani was common, and infection might be carried on the nails. He agreed on the importance of prophylaxis, but had been disappointed in the use of yeast, colloidal manganese, and butyrate of manganese. He thought a vaccine often had more value in boils than in any other skin complaint. In local treatment the two most useful things were X rays and drying up the boil by anhydrous magnesium sulphate and glycerin, equal parts, in a paste applied continuously.

Dr. A. M. H. GRAY (London) doubted if infected clippers played much part; the back of the neck was specially liable to acne, and an acid-fast bacillus could often be obtained from it. This was why X rays gave good results in that area. He had found transitory glycosuria in a number of cases. He thought the essential thing for a discharging boil was an antiseptic absorbent dressing; a spirit dressing would soon dry up and permit the growth of organisms. He used 1/4000 mercuric chloride on small dressings.

The PRESIDENT thought vaccines should be given at first in very small doses, and that incision was bad treatment.

At the same section Dr. J. G. TOMKINSON (Glasgow) described a group of cases of Monilethrix in five generations, and Dr. A. BURROWS presented from the London Hospital statistics of a dermatological clinic.

SECTION OF PHYSICAL MEDICINE

AT the first meeting of this section the chair was taken by Sir LEONARD HILL, the President, and Dr. JAMES MENNELL (London) opened a discussion on the

Rôle of Manipulation in Therapeutics

He said that a definition of manipulation was not easy; it was neither massage nor active or passive movement. A passive movement was essentially one in which force played no part and which could only be performed when the patient's muscles were in a state of complete voluntary relaxation. He defined manipulation as the act of moving a joint so that an impediment to movement was overcome and motility was restored. Joint manipulation was an art with a special technique; "the twist" was the thing, and he had only appreciated the essential nature of this twist after years of close study and research. It involved putting each joint through those movements which were not under voluntary control before attempting to perform those that were under voluntary control. Manipulation could convey benefits to the patient, and should be taught in medical schools. It might be successful if active pathological processes were quiescent (this proviso rested on a far from simple diagnosis, demanding minute examination and wide experience); if the limitation of movement were due to adhesions or to a locking of two joint surfaces on one another; and if the manipulation were performed with such skill that no undue strain was placed on any normal structure. He believed that joints could "lock"; the only explanation of the successful results of some manipulations seemed to be a "seizing-up" of this kind. Dr. Mennell argued that joint lesions might cause remote effects: referred pain with all its results, and effects in relation to the joints in the extremities and of the spinal column. Any lack of coördination in the pull of the extrinsic

muscles of respiration, for instance, might strain a costo-vertebral joint and cause locking; the manipulative treatment of the consequent traumatic pleurodynia was an excellent example of a "five-minute miracle cure." The worst error in manipulative treatment was erroneous diagnosis; the confirmed believer in osteopathy would claim that appendicitis and asthma had been cured by manipulation when, in fact, what had been cured was pain in the right iliac fossa from sensitiveness of the anterior sacro-iliac ligaments, or a cough due to irritation of the sympathetic by immobility of the thoracic spine. The immense reputation of the unqualified practitioner was largely attributable to diagnostic errors on the part of the qualified.

THE RÔLE OF ELECTRICITY IN TREATMENT

Dr. E. P. CUMBERBATCH (London) said that, since electricity was necessarily an expensive method of treatment, its rôle should be those conditions in which it produced quicker or better results than other therapeutic agents, or in which it succeeded where others failed. It was not, however, possible at present to compile a list of diseases in which electricity was agreed to be the best treatment, and he would therefore discuss the ways in which electricity acted in rectifying pathological conditions. Electricity acted either by chemical or by thermal effects. High frequency therapy was in fact thermal therapy. The most widely used method of application was diathermy, in which the current was passed through the tissues for the purpose of raising their temperature en masse. The rôle of electricity in thermotherapy was to heat tissues which lay beyond the reach of heat from other sources. In the ordinary way the current did not raise the temperature of the vascular organs of the trunk; to do this one of the electrodes must be placed in close proximity to them. The result of the heat produced was vasodilatation and acceleration of the blood flow, but these changes alone did not explain why diathermy could free the cervix of organisms with a high lethal temperature, or correct the endocrine imbalance of the menopause when applied to the ovary.

In surgery high frequency currents were used for clean cutting, for coagulation of parts to be destroyed and for fulguration or electro-dessication. The galvanic current could produce chemical caustics in the body which could be used for the destructive treatment of abnormal tissues. It could also be used to introduce medicinal substances into the skin; within the range to which they could immigrate the ions might almost be said to saturate the tissue, and the results were immeasurably better than those obtained from an application of lotions. The galvanic current could also aid the resolution of inflammation when progress by natural methods was stayed. Anodal galvanism relieved pain and swelling after trauma. The sinusoidal alternating current was a potent reliever of pain in the later stages of neuritis and had high value in the treatment of anterior poliomyelitis. The profession could hardly be expected to consider the claims of a current until its method of action was rationally explained.

Mr. C. BOWDLER HENRY (London) described methods of applying diathermy currents inside the mouth and to external irregular surfaces, with particular reference to the neuralgias that tended to set in after the removal of septic teeth. A residual infection manifested itself, he said, either by a recurrence of the original trouble after temporary relief or by a trigeminal neuralgia. Tin foil was moulded on the dental cast to form a closely-fitting electrode for the part to be treated, and troughs were made for external application to the lower jaw. The treatment had been a great success, and the only drawback had been the expense of making a special plate for each patient. Mr. Henry illustrated his methods by lantern slides.

Sir R. STANTON WOODS (London), in discussing manipulations, classified adhesions as: (*a*) cohesions between folds of synovia; (*b*) cohesions between the synovial folds inside tendon sheaths; (*c*) thickenings of joint capsules; (*d*) periarticular infiltration; (*e*) adaptive shortening of muscle; and (*f*) scarring of muscle. He suggested that good only resulted from manipulation where there was cohesion, and that great harm might follow if an anæsthetic were used in any of the other conditions. Tearing a band of synovial adhesions would only succeed in a joint normally susceptible of a wide range of movement; otherwise the adhesions would merely stretch. In small joints such as the vertebral it was better to stretch infiltrated tissues and even intra-articular and vaginal adhesions without an anæsthetic. The shoulder-joint was by far the most hopeful field for movement under an anæsthetic but, rather curiously, the hip-joint was disappointing. Adhesions from injury offered the best results. An anæsthetic was a valuable diagnostic agent between synovial cohesions and other cases of limitation of movement, but it should always be preceded by a good radiogram. Some joints affected by non-suppurative generalised arthritis might, in the quiescent stage, be greatly benefited by movement under an anæsthetic, but the procedure must be regarded largely as an examination. Periarticular fibrosis was usually cured by more gradual methods, but residual stiffness might be removed. In the early stages an anæsthetic might have its dangers. Movement under an anæsthetic was much more often justifiable than was at present realised. After intra-articular suppuration, suppuration in tendon sheaths, and non-suppurative inflammatory infiltration, conscious manipulation was much safer, and only harm could result from attempting to stretch forcibly a scarred muscle. Nitrous oxide gas was not a good anæsthetic for the purpose, as full relaxation was necessary and there must be no hurry.

Dr. J. COWAN (Manchester) agreed with Dr. Cumberbatch, except in his statement that high frequency currents did not heat up the vascular organs. It was possible to raise the temperature of the whole body to 106° or more by applying the current longitudinally. Diathermy was a safer method than malaria for producing pyrexia. Marked general vasodilatation could be obtained by the diathermic current, and was of great value for degenerative changes in the vessel walls. It constituted a form of arterial gymnastics which helped to maintain and restore the elasticity. He thought that stellate veins and telangiectases were best treated by fine diathermic sparks. In the reaction of degeneration and in the treatment of paralysed muscles electricity had a field of its own, and nothing could compare with the faradic currents for the restoration of atrophic muscles. Another rôle of electricity was the stimulation of muscles and nerves by the distribution of ions.

Dr. L. CAPPER-JOHNSON (London) said that Dr. Mennell had proved his case for the more frequent adoption of manipulation. Any medical man with a mechanical sense could acquire sufficient knowledge to avoid the unpleasantness of seeing comparatively trivial ailments which he could not relieve cured by a bone-setter. The sooner the profession realised this the better.

MANIPULATION UNDER WATER

Dr. FORTESCUE FOX (London) said that the specialised art of manipulating joints should be practised by medical men, but it seemed doubtful whether this "tactus eruditus" could ever be taught. Three methods of manipulating in water, developed within living memory, had a wide application. The first, or "Winternitz bath," could now be found in most of the continental clinics. Brisk, rapid frictions in water at 90° were found to be highly stimulating and tonic, and enabled cold to be borne even by chilly subjects. The second, or sedative manipulation douche, combined four factors: the gentlest manipulation, a slow rhythm, subthermal temperature, and flowing water without pressure. The English sedative douche was more nearly perfect than that of any other country, but it was necessary to keep the pressure of the water at zero. The third, also of English origin, was the hyperthermal whirlpool, in which the most sensitive limbs could be exposed to the friction of water and of the hand at high temperatures. Complete relaxation, intense hyperæmia, and increased circulation were produced. Dr. Fox emphasised the fact that these three types of manipulation under water were associated with three grades of heat: manipulation at cool temperatures being highly stimulating, manipulation at subthermal temperatures being sedative, and manipulation at hyperthermal temperatures being anæsthetic. Heat, movement, and moisture, so combined, could produce effects which, so far as was known, could not be obtained in any other way.

Dr. C. A. ROBINSON (London) said that the physiological changes which could be produced by electricity were increase of blood-supply, muscular contraction, chemical changes on moist surfaces, and the effects of heat. Cathodal applications to moist surfaces caused a free flow of watery alkaline fluid, and the anode could be used to produce a superficial slough. The rapid and marked relief of pain and spasm by diathermy suggested an analgesic effect apart from the effect on blood-supply. In later stages these currents aided resolution. Recent synovitis of joints and synovial sheaths and bursæ might succeed under these methods alone. Faradism would cure painful adhesions of fibrous aponeurosis. Un-united fractures could sometimes be rapidly healed by the sinusoidal current. In traumatic paralysis the affected structures could be kept in good condition by direct current during the period of recovery of the nerve. Healing of ulcers, sinuses, and disorders of the mucous membrane was promoted by the cathodal direct current or ionisation of such metals as zinc. Diathermy brought about subsidence of inflammation of the pelvic organs in both sexes. It could be directly applied to the cervix or to the prostate to clear up infection. Diathermy relieved the subjective symptoms and arthritis of the menopause, and reduced blood pressure permanently in menopausal hyperpiesis. Members of the Chartered Society of Massage and Medical Gymnastics undertook only to treat patients on the prescription of a medical practitioner, and it was therefore important that doctors should realise the importance of the measures they applied.

Dr. THOMAS MARLIN (London) said that manipulation might be used for soft tissues as well as for joints, and in some cases this was the essential part of it. The common belief was that the benefits of manipulative treatment were derived from the breaking down of adhesions, but a true joint manipulation was something more like the reduction of a recent dislocation. "Bone-setting" was not really bone-setting at all. Patients liked to think that a bone had been pushed back into place by the bone-setter, and manipulators liked to believe that an adhesion had been broken down, but in most cases the manipulation only separated the joint surfaces and caused a suction sound. This had been described as "springing" the joint. It was accomplished by carrying the joint into extreme flexion or extension, and then strongly exaggerating that position. It did not differ from what many people did when they cracked their fingers. Exactly the same sounds could be produced on the other side of the body, which was presumably not affected. Dr. Marlin believed that joints became slightly stuck or jolted into a position of mechanical disadvantage, just as the driving wheel of a lathe might stop at a dead centre and have to be knocked over before the engine worked again. He suggested that a joint might play a very active part in the nutrition of muscles. Osteopathy had shown the medical profession useful methods of manipulation. It was important to teach manipulation to practitioners so that they could test its real worth by personal trial.

Dr. C. G. TEALL (Birmingham) said that if members of the medical profession working in other branches were to appreciate the value of electricity in treatment it was essential to confine it to those conditions for which electricity was not only the most efficient method but also the most suitable. What was required was a healthy scepticism. There were limits to the value of electrical treatment. It was desirable to find a physiological basis for the methods employed, but an empirical method should be accepted when it was supported by the clinical experience of a man qualified to express an opinion—not that of a dabbler with apparatus. It seemed difficult to ascribe all the results of diathermy to the production of heat alone. He had not been able to produce a permanent fall of blood pressure in hyperpiesis, but the patients were undoubtedly benefited. He doubted also whether the penetration of the ions had very much to do with the great success of ionisation.

Mr. W. E. TUCKER (London) said that electrotherapy combined with massage and movements would often obviate manipulation. It was most important to work out a subperiosteal bruise at once or thickenings and adhesions might form. A hæmatoma tended to track along tissue planes or wander by gravity. In a partially ruptured muscle, for instance, which was strapped and left alone the hæmatoma organised, producing a fibrous scar and adhesion to surrounding structures. Many so-called muscle herniæ were really partly organised hæmatomata with fluid centres. Muscle injuries should be treated by support, while repair was taking place; deep massage to bring out the bruise; diathermy or ionisation; surging faradism and remedial exercises. Tender spots remote from the site of injury indicated the tracking of blood along tissue planes. Adhesions once formed should be broken down by manipulation, and this should be followed by a daily course of massage and exercises. Secondary results of an injury should never be forgotten—e.g., a fall on to the shoulder causing an acromio-clavicular dislocation might also cause injury to the shoulder-joint resulting in adhesion, tearing of the trapezius and scalene muscles, causing a brachial plexus neuritis from organisation of blood clot, and bruising of the outer end of the clavicle and acromion process. Bruising of bone or cartilage was excruciatingly painful, and was best treated by diathermy and deep massage. Hæmatoma in bone started the growth of sarcoma. The disabilities caused

by muscle strain or weakness were not fully realised. Many patients with tennis elbow complained of pain over the external epicondyle and also at the wrist. On the theory that the muscles were chronically strained the treatments to be tried should be placed in order as follows: (1) manipulation; this could be applied to all patients who had pain on hyperextension; (2) support of the extensors by strapping; (3) surging faradism to strengthen the muscles; (4) voluntary exercises. The rheumatic type should be treated by clearing up any septic focus, blistering the skin, acupuncture, and Osgood's operation. Many patients who suffered from chronic muscle strain were treated for years for neuritis; examples were "rider's muscle," strain of the abdominal oblique muscles, thought to be prehernial; strain of the hamstrings, often seen in ballet dancers and gymnasts; knee strain from wasted quadriceps; writer's cramp and occupational palsies; and bursitis. The muscles should be strengthened by surging faradism after a period of support. A draught might set up a reflex, as in rheumatic stiff-neck and lumbago. The effusion might organise, but great relief could be obtained before adhesion was formed by direct current, massage, and ionisation.

The openers replied.

REVIEWS AND NOTICES OF BOOKS

Abnormal Conditions of the Teeth of Animals

in their Relationship to Similar Conditions in Man. By Sir FRANK COLYER, K.B.E., F.R.C.S., L.D.S. London: Dental Board of the United Kingdom. Pp. 167. 5*s*.

THE eighth series of lectures delivered under the auspices of the Dental Board have been published in book form. Sir Frank Colyer's position as honorary curator of the odontological collection in the museum of the Royal College of Surgeons has given him a unique opportunity of collecting data bearing on the comparative anatomy and pathology of the teeth and jaws, and the Board is to be congratulated on having induced him to publish some portion of his store of knowledge. Perusal of the book shows that animals—even those living under what might be termed natural conditions—are far from immune from diseases of the teeth, and that tumours, dental caries, and pyorrhœa are all common in many species. Caries, it is true, is relatively rare in wild animals, though several examples are here recorded; but in domestic animals it is of course by no means uncommon. Sir Frank thinks that defective structure plays little part in predisposing to this condition, for he finds that animals immune from caries have teeth which would be regarded by most pathologists as distinctly defective in formation. Hypoplasia of the teeth—which chiefly affects captive animals—may be due to deficiency of vitamin D, but on this point he offers no opinion. The chapter on progressive destruction of the tooth sockets is a valuable contribution to the pathology of pyorrhœa, and should be consulted by all workers in this subject, while the last chapter, on irregularities of the teeth in animals, is an important addition to the classical work of Brash, described in the preceding volume of the Dental Board lectures.

The book is illustrated on a scale that makes the price seem ridiculously small. And if there be any dentists inclined to grumble that a part of their annual fee has been utilised for the publication of a work apparently remote from the practice of dentistry, we can only express, in reply, a belief that in due time it will yield harvest to every practitioner of dentistry.

Muscular Work, Fatigue, and Recovery

By G. P. CROWDEN, M.Sc., M.R.C.S., Lecturer in Industrial Physiology at the London School of Hygiene and Tropical Medicine. London: Sir Isaac Pitman and Sons, Ltd. 1932. Pp. 74. 3*s*. 6*d*.

IN this résumé of three lectures delivered at the London School of Economics, Dr. G. P. Crowden aims at explaining the elementary physiological principles of human muscular activity, so that they will be intelligible to employers, works managers, and others responsible for the organisation of labour. The first lecture deals with the phenomena of simple muscle contraction, fatigue, and recovery, beginning with the early observations of Walter Fletcher in 1902 and proceeding through the researches of A. V. Hill and his colleagues. The language is simple and there need be no apprehension that technical phraseology will confuse the lay reader. In the second lecture the application of these principles to industrial requirements is elaborated with an analysis of the categories of muscular work usually encountered. The Kaiser-Wilhelm Institute—formerly at Berlin, and now at Dortmund in Westphalia—is described as a model of convenience for research along physiological, biochemical, and psychological lines. In the third lecture a full account is given of Sir Leonard Hill's pioneer experiments of some 20 years ago on humidity and cooling, together with the various influences of environment generally.

This manual achieves all to which it aspires, and might be read with profit by medical students, as well as those to whom its messages are addressed directly.

Practical Treatment of Skin Diseases

By EDUARD AHLSWEDE, M.D., formerly Assistant Physician, Eppendorf Hospital, Hamburg. New York: Paul B. Hoeber. 1932. Pp. 770. $12.

THIS comprehensive treatise is commended by the author's teacher, Prof. P. G. Unna, of Hamburg, and by Dr. Howard Fox, a well-known dermatologist in America. Its teaching is sound and varied not only on dermatology proper, but on the ancillary sciences on which modern therapy relies. The reader will appreciate the convenience of such condensation of knowledge in Part I., where actinotherapy, X rays and radium therapy, diathermy, electrolysis, physiotherapy, and the technique of local treatment are all described. Part II. concerns itself with the treatment of the individual diseases; in an appendix (A) there are brief schematic tables of the more important remedies and methods in daily use for each particular complaint, while appendix B gives a table of equivalents of metric and standard measures. There is much resort to cross-references, and the general index is full and careful. The illustrations are mostly of apparatus.

An account of the section on eczema will give some idea of the task which Dr. Ahlswede has set himself.

There are 53 pages, forming an essay on the symptoms, ætiology, treatment, practical management, and analysis of the probable causes—internal and external. These are discussed in detail and with a changing emphasis which is expressed by alteration in the size and face of the type employed in the printing. No less than 18 internal causes of eczema are tabulated, and to each of them is allocated a more or less specific line of treatment. They include such conditions as a faulty purine metabolism; carbohydrate dyscrasia; faulty fat, mineral, and water metabolism; auto-intoxications; focal infections; endocrine anomalies; anæmia; nephritis; hepatitis; cystitis; abuse of stimulants; and nervous disturbances. The external causes, which hold the most important place in the opinion of most European dermatologists, are dismissed in a few lines. There follows a disquisition on the treatment according to the stage of inflammation present, and a long list of remedies and their particular indications—no less than eight pages of them. The indications for actino- and radiotherapy are cited, and this section is followed by one on the management of eczema according to the predominant clinical symptoms. There is considerable repetition, and the newcomer to dermatology would be much confused by the number of the methods and remedies recommended. This criticism applies in fact to the whole book. It is in reality an encyclopædia of dermatological therapy, compiled from many sources and schools. But it is up to date and will certainly make its mark.

The Anatomy of the Human Orbit

Second edition. By S. ERNEST WHITNALL, M.D., B.Ch. Oxf., M.R.C.S., Professor of Anatomy, McGill University, Montreal. London: Humphrey Milford, Oxford University Press. 1932. Pp. 467. 25*s*.

This book on the orbit and accessory organs of vision appeared some ten years ago and is a standard work of reference on the subject; we welcome heartily this new edition. Prof. Whitnall has gone through his material thoroughly, and has added a considerable amount of new matter, especially in those parts of the book which deal with the associated nervous systems. He has incorporated effectively here the anatomical substance of many of the papers which have appeared in the ophthalmological journals within the last ten years. Much of the work with which he has had to deal is naturally of a physiological nature and, as is customary under such conditions, a good deal of confusion in description results. We hope that Prof. Whitnall, in future editions of his valuable work, will see his way to the insertion of some sort of *collation raisonnée* of these researches; they call for systematisation. There is a very good bibliographical index.

The Practitioners Library of Medicine and Surgery

By various contributors. London: D. Appleton and Co. 1932. Vol. I., *Anatomy and Physiology*, pp. 1271; Vol. II., *The Technic of Clinical Medicine*, pp. 984. £2 10*s*. per volume.

THESE are the first two parts of a large new American work which is to consist of 12 volumes in all, and which is designed as a work of reference covering the whole field of medicine and surgery in its practical aspects. The fundamental difficulty with a series of this kind, however excellent when published, is the high initial cost, and the likelihood that certain parts will soon be out of date. The same disadvantage applies of course to all medical works, though usually on a lesser scale. The first volume deals with anatomy and physiology, and it is no more than right that these subjects should be considered an important part of a treatise on practical medicine, which as it daily grows less empirical becomes increasingly dependent on the basal sciences. The section on anatomy is sufficiently detailed to meet the general purposes of clinicians. Emphasis is given to structures and their relations which are significant from the point of view of technical procedures, and which serve to explain the symptoms and signs produced by disease. The physiological section is again written from the standpoint of pathology. The treatment of the subject cannot be very full in the space allotted, but what is more important is that principles are clearly set out and in a manner calculated to stimulate interest.

Volume II. is concerned with the technique of bedside and laboratory examinations. There is some overlapping, but this may not be altogether without value—as for example, the repeated assertion that a full history is a vital part of the elucidation of a case. The standard of the first volume is hardly reached, and there is perhaps a little too much literal quotation in some parts of the book. The text is clearly written, and in general the matter is sound, although here and there are statements which would not be generally accepted, and occasionally there is an important omission. The names of many of the contributors to both volumes are well known in this country as workers and writers of repute. The production and the illustrations are very good indeed.

Diseases of the Coronary Arteries (Myocarditis)

By DON. C. SUTTON, M.S., M.D., Associate Professor of Medicine, Northwestern University; Attending Physician, Cook County Hospital, Chicago; and HAROLD LUETH, Ph.D., M.D., formerly Instructor Physiology, Northwestern University, Chicago. London: Henry Kimpton. 1932. Pp. 164. 25*s*.

Dr. Sutton and Dr. Leuth cover ground which has lately attracted many explorers. Their book is easy reading, and is also generously illustrated with diagrams, electrocardiograms, and photomicrographs. It differs little from other works on this subject, with the important exception that it has a valuable section on the physiology of the circulation of the heart, and one on the pharmacological action of drugs and other substances on the coronary circulation; details are given of recent experimental work, and these are critically discussed. The coronary artery circulation has been investigated by many different methods and with very varying success; most interesting are the results obtained in studying the influence of the cardiac cycle, the heart rate, the arterial pressure, changes of rhythm, and chemical factors on the blood flow. The authors of this book have themselves done a good deal of work on the effect of acute temporary occlusion of the coronary arteries, and they can therefore appreciate the difficulties of experimental investigation of this particular problem. Not less interesting is the section on pharmacology, particularly the part on the action of the various vasodilators, a close comparison of whose effects is given in tabular form. The section on treatment follows orthodox lines. There is an extensive bibliography.

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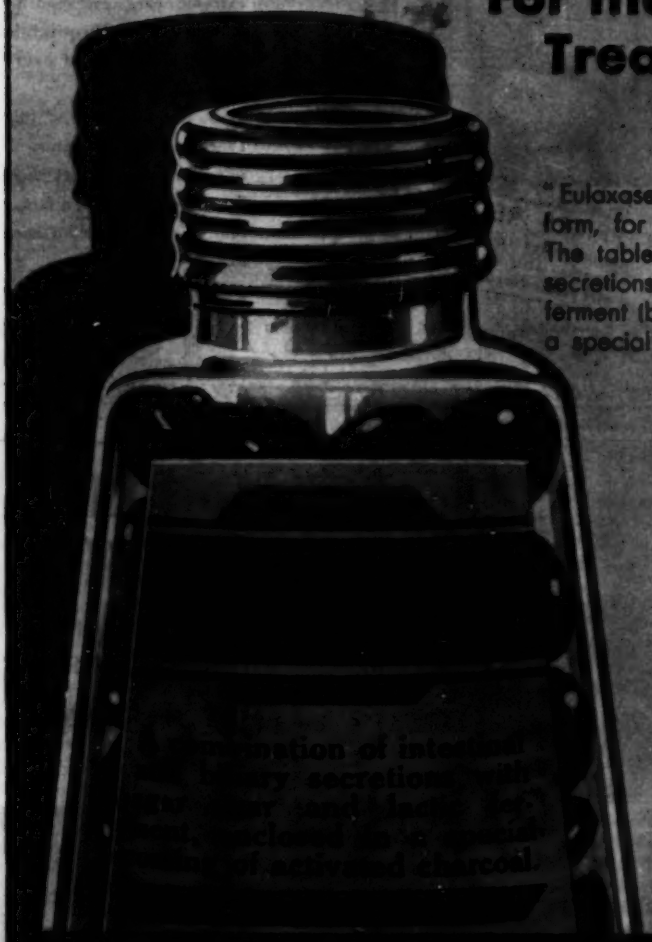

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[*See also pp.* 16 & 25.]

THE LANCET

LONDON: SATURDAY, AUGUST 20, 1932

THE ANÆMIAS OF PREGNANCY

MANY writers have been trying to classify the anæmias of pregnancy, and have postulated states of the bone-marrow to explain the various blood pictures found. Advance in other fields of hæmatology has shown, however, that many bone-marrow lesions are secondary to disturbances of gastro-intestinal function; notably in Addisonian pernicious anæmia, tropical megalocytic anæmias, and the various anæmias associated with idiopathic steatorrhœa. It is pertinent therefore to consider how far pregnancy anæmias may be associated with similar disorders.

Pregnancy seems to act as the extra strain necessary to produce anæmia either of the hypochromic or hyperchromic megalocytic type in patients who have a predisposing cause in the form of a disturbed gastric function. IVY and his co-workers [1] showed that in gastrectomised dogs anæmia developed only when pregnancy intervened. WILKINSON [2] has more recently reported two cases of typical Addisonian pernicious anæmia appearing during pregnancy in women who were known to have achylia, and belonged to families with an apparent tendency towards pernicious anæmia. STRAUSS,[3] in a study of 35 pregnant women with a hæmoglobin below 45 per cent. and no other complications, found 19 with complete anacidity after histamine, and 12 with little or no free hydrochloric acid after alcohol test-meals. It has been readily assumed that the demand of the fœtus for iron, and possibly other hæmopoietic substances, was the sole cause of the "physiological anæmia" of pregnancy, and played its part in the development of the more severe forms. STRAUSS, however, has brought forward evidence which suggests that pregnancy may have an influence on hæmopoiesis in other ways. He found on examining the gastric juice of 12 normal women that more than half of them showed during pregnancy a decrease or absence of free hydrochloric acid, which returned to normal on delivery. Those with post-histamine anacidity developed the most serious grade of anæmia. This suggests that pregnancy definitely affects gastric function, and in so doing disturbs the body's power to absorb and digest essential factors. Such evidence indicates the danger of accepting ADAMSON and SMITH'S [4] view that what they call a moderate anæmia with a hæmoglobin as low as 50 per cent. is physiological, and does no harm to mother or child. STRAUSS has further shown that the hypochromic anæmia, readily relieved by iron, is more severe in patients with a bad dietary history than those with a good diet. The average loss of hæmoglobin in the former group was 12 per cent. as compared with 5 per cent. in those with both good diets and good gastric secretion.

It is clear therefore that gastro-intestinal function plays a definite part in the production of pregnancy anæmias. Pregnancy may in itself produce a disorder of gastric function which apparently hinders the absorption of essential factors, or when such a disorder is already present may, by the additional demands of the fœtus, so increase an existing tendency as to produce definite anæmia. Since mild degrees of anæmia are so common as to be called the physiological anæmia of pregnancy, there is here a profitable field for experimental investigation rather than armchair hypothesis. Iron, liver or its substitutes are of therapeutic value according to the type of anæmia, but the possibility of prevention, of the hypochromic forms at least, by adequate diet and possibly prophylactic doses of iron and hydrochloric acid should not be forgotten.

[1] Ivy, A. C., Morgan, J. E., and Farrell, J. I.: Surg., Gyn., and Obst., 1931, liii., 611; see THE LANCET, 1931, ii., 1201.
[2] Wilkinson, J. F.: Jour. Obst. and Gyn., Brit. Emp., 1932, xxx., 293.
[3] Strauss, M. B.: Jour. Clin. Invest., 1932, xi. (Proc.), 809
[4] Adamson, J. D., and Smith, H. F.: Canad. Med. Assoc. Jour., 1932, xxvi., 666.

THE RULES OF DEATH CERTIFICATION

IN a letter to our correspondence columns this week Dr. R. W. JAMESON criticises the rules drawn up by the Registrar-General for primary tabulation when joint causes of death are stated. The effect of these rules is, he fears, to impair the accuracy of the recorded causes of death, and he instances the way in which they may give a false impression of the prevalence in this country at the present time of fatal small-pox and malaria. Dr. JAMESON'S qualms are, we know, shared by others who have expressed a hope that the rules now in force may in the future be discontinued in favour of the expressed opinion of the certificate. We may assure them that it is the definite policy of the General Register Office to rely upon the opinion of the certificate instead of upon arbitrary rules, and that the only hindrance to giving effect to this policy is the failure of the medical profession, so far, to make extended use of the new form of certificate, which was designed to make it easier for the certifying practitioner to provide the Registrar-General with information in the absence of which rules of classification must contain a large arbitrary element. The drafting of these rules conforms closely to the practice of other countries whose statistical publications are on the same level of completeness as our own. The whole responsibility for certification is laid, and rightly laid, on the shoulders of the certifying practitioner, who in criticising the rules for classification should not overlook the fact that he can override them. Knowing that pneumonia is a serious disease at present, and small-pox in this country a trivial disease, it may seem very silly, as Dr. JAMESON implies, to attribute the death of a patient, upon whose death certificate both causes are entered,

to small-pox. But it was quite open to the practitioner to tell the Registrar-General that, in his opinion, the patient died of pneumonia, and that the pneumonia did not stand to the small-pox in the relation of consequent to antecedent. Our own General Register Office is, we believe, one of the few statistical departments in the world which is prepared to take this attitude. Other countries, including America, take the view that a central statistical office can properly veto or alter the attributions of causes of death. It should be clear enough that the revision of medical diagnoses by the General Register Office, which Dr. JAMESON suggests, would make the carrying out of its policy more difficult than it now is. Many certifying practitioners do not take the trouble to tell the Registrar-General what they regard as the relative importance of various stated causes. Is it likely, if they know that he might override their opinions, they would take more trouble than before? It seems inexpedient for a central statistical department to claim or assume the right to revise certified diagnoses. Any gain in accuracy would be more than set off by the creation of a suspicion in the minds of both practitioners and the general public that the national statistics were being cooked in the interest of some official theory.

PYREXIA IN THE TREATMENT OF G.P.I.

SINCE malaria was first employed in the treatment of general paralysis of the insane many other modes of therapy have been tried. Artificial fever has been induced by chemical, biological, and physical agents. The injection of sodium nucleinate was used some years before WAGNER-JAUREGG began his experiments with benign tertian malaria; sulphur, T.A.B. vaccines, milk injections, relapsing fever, and latterly physical heat have all been tested. As is shown, for instance, in the report of the Dermatology Section of the B.M.A. (p. 398), and in Dr. T. C. GRAVES'S paper in our issue of July 9th, these various agents have been applied to a great many conditions besides general paralysis; but this disease provides at least a convenient way of assessing their relative advantages.

In America much work has been done on the induction of artificial fever by physical means, and a good account of these has lately been given by E. and H. BIANCANI.[1] Hot baths, light baths, diathermy, and short wave-length irradiation have all been used with success. In 1926 J. F. SCHAMBERG and A. M. RULE performed some experiments in which rabbits inoculated with spirochætes were protected against the development of primary syphilitic lesions by giving them hot baths. H. KAHLER and F. KNOLLMEYER have recorded good results from the same remedy in the treatment of general paralysis, and state that the serological findings showed improvement. Diathermy, also, has been extensively used, and C. A. NEYMANN has reported 150 cases of general paralysis so treated, of which 41 per cent. showed complete remissions. Dr. C. B. BAMFORD, however, in our last issue gave an account of its use in 13 general paralytics, 4 melancholics, and 4 cases of dementia præcox, from which it appears that the only paretic who was discharged had had a course of tryparsamide concurrently. Diathermy, though easily controlled during treatment and not in any way dangerous to the more debilitated type of patient, appears to have a very limited application in mental hospital practice. E. HALPHEN and G. AUCLAIR[2] give reasons for thinking it inferior to the short-wave Hertzian current.

In this country much more use has been made of sulphur injections, and reports on this remedy have steadily accumulated in our columns.[3] Dr. P. K. MCCOWAN and Dr. M. L. M. NORTHCOTE, who described their experiences in THE LANCET of July 30th, have been chiefly concerned with schizophrenics, and put forward the interesting suggestion that the improvement in habits occasionally noted in this condition is not the direct effect of the sulphur or the fever. "While it is possible," they say, "that some beneficial biochemical changes are set up in the organism, there seems to be little doubt that the benefit which results from the treatment is largely, if not entirely, psychological, the physical illness, with its pain and general discomfort, and the incidental nursing attention interrupting the phantasy life of the patient and forcing reality upon him." However this may be, the cutting short of attacks of benign stupor with sulphur clearly deserves further trial.

Elsewhere in this issue Dr. N. G. HARRIS and Dr. J. A. BRAXTON HICKS make an illuminating comparison of the results of sulphur and malarial treatment. Their observations support the conclusion that sulphur is the less drastic remedy, and is, therefore, suitable where the patient is too ill to bear the additional burden of malarial infection. But the latter usually produces a higher pyrexia with quicker and more lasting results, and if we are to recommend sulphur it must be rather for its safety than its superior efficacy. The mortality of induced malaria is still fairly high—perhaps unduly so—and if death occurs within two months of treatment, malaria, even if not directly responsible, should be considered a contributory factor. On the other hand, the disease to be treated is one which makes big risks justifiable, and there are objections to all the remedies available. The daily injection of sulphur, and other chemical agents, entail much labour and must be distressing to the patient, while with diathermy there is a risk of burns from the large electrodes, especially when dealing with people who are frequently restless and in no mood to coöperate. The short Hertzian waves solve many difficulties experienced by those working with diathermy; heat is distributed more regularly and evenly and their application is far easier, nor does there appear to be the same risk of burns; but here again it is doubtful whether the method is practicable on a large scale for mental patients.

[1] Rév. d'actinol. et de physiotherap., 1932, viii., 136.

[2] Ibid., p. 154.

[3] THE LANCET, 1931, ii., 200; 1932, i., 338, 340.

Malaria, with all its disadvantages, has stood the test of time and, combined with tryparsamide, probably affords the best form of treatment of general paralysis available in our present state of knowledge. Though other kinds of therapy produce about the same proportion of remissions, we cannot yet be sure that they are as permanent as those obtained with malaria. It is a curious fact that in all these varieties of treatment not more than 30 to 40 per cent. of remissions are obtained. One may speculate indefinitely on the mechanism by which the agents work. The artificial fever is evidently a factor common to all, but despite its successful application to a disease which was previously considered fatal, and despite the many inquiries that have followed, we have yet to discover the exact process which yields such remarkable results.

ANNOTATIONS

AN INSTALMENT OF THE NEW CENSUS

THE first of the county volumes in which the results of the census of 1931 will be fully set out relates to the administrative county of Middlesex, which has had between 1921 and 1931 a faster rate of growth than any other county in England and Wales. Its rate of increase, 30·8 per cent., is more than five times as great as that for England and Wales as a whole. This growth largely represents the development of the Metropolis itself, for, during the last 30 years, the population of the County of London has declined, while the outer ring, the "dormitory areas" lying outside the Metropolitan County, has shown continual development. The most prominent of these inter-censal changes is that recorded for Hendon U.D., in which the increase between 1921 and 1931 is no less than 101 per cent. This increased population of the county has raised the density from 8·4 in 1921 to 11·0 persons per acre in 1931, but, in spite of this, a considerable reduction has been effected in both the numbers and proportions scheduled as living in "overcrowded" conditions (two or more persons per room). The number of "overcrowded" families has been reduced by 2835 and the population therein by 21,046, so that the proportions living in such conditions are now less than half those in all England and Wales. This change represents an important improvement in the public hygiene of the county.

The only novel feature introduced at the 1931 census was one which provided for a specific return of the "usual residence" of each individual, irrespectively of the address at which he or she was enumerated. In this particular area the difference between the *de facto* and the *de jure* populations is very slight; for the county, as a whole, the resident population is but 2 per 1000 in excess of the enumerated. As a result of the continually falling birth-rate it is noteworthy that two-person and three-person families now account for very nearly half of all families, and large families of eight or more contribute only 3·4 per cent. to the total. The average size of the family is 3·66, or 10 per cent. lower than in 1921. Females considerably outnumber males both in population and electorate, the average female excess for the whole county being 13·2 per cent. in respect of population and 18·1 per cent. in respect of the electorate, the excesses being most marked at ages over 40. At ages 20–29 there is a considerable preponderance of males, which may be explained partly on the assumption that they comprise a large proportion of inward migrants whose presence depends on the attractiveness of the Metropolis as a labour market, and partly on the fact that the figures of 1921 were unduly depleted through war losses.

Much of this information is of peculiar value to the economist and social worker, but the public health administrator will find plenty of interest, and, indeed, cannot afford to neglect the basis of the county's vital statistics.

A STUDY IN VACCINATION

A SMALL but interesting epidemic of small-pox is reported by the Massachusetts Department of Public Health.[1] It took place in the town of Fitchburg, an important manufacturing and business centre of north-central Massachusetts, with a population of just under 40,000. As vaccination is required by law before attendance at the public schools, the number of unprotected persons is relatively small, consisting mainly of pre-school-children and adult immigrants from New Brunswick and other Canadian provinces. At the beginning of January, 1932, a number of cases of small-pox were discovered in the city. Investigation showed that there had been mild cases as far back as the previous November, and only the fact that several quite severe cases had developed called attention to the situation. Since it was impossible to trace the contacts of all the cases, general vaccination was ordered; and it seems to have been effectively carried out, for within five days of the order close upon 40,000 persons had been vaccinated. Within ten days the epidemic ceased. While the vaccinations were being carried out the opportunity was taken to obtain records of age, dates of previous vaccinations, and history of small-pox for all those vaccinated. In the whole city it was found that 13·7 per cent. of the population had never been vaccinated, while in the district in which 56 of the 60 cases occurred nearly a quarter of the population was unvaccinated. All the patients with small-pox were of French-Canadian descent, being either immigrants or children of immigrants, but all had been in Massachusetts for some years. Of the 60 patients traced, 49 proved never to have been vaccinated, 8 had been vaccinated only 4 to 15 days after apparent initial exposure, and only 3 had been vaccinated before the epidemic—in each case more than 45 years before. Most of the cases were in people under 6 or over 30 years of age, the groups in which were the largest proportion of unprotected individuals. These figures speak well for the efficacy of the protection afforded by vaccination; on the other hand, it is noteworthy that without any administrative action the epidemic showed very little tendency to become severe. It is admitted that the first case appeared at least two months before the outbreak came to official notice; in the area chiefly affected there were nearly 1600 unvaccinated persons; and yet amongst these 1600 (in a total population of 5624) only 53, or 3·3 per cent., actually took small-pox. With firm administrative action the epidemic certainly came to a rapid

[1] Feemster, R. F., Anderson, G. W., Burns, R. F., and de Wolfe, H. M.: New Eng. Jour. Med., July 14th, p. 82.

end; but in a relatively long absence of preventive measures it showed no tendency to a violent flare-up or even to a slow serious extension. This is a phenomenon that has been previously observed—for instance, in Melbourne—and is clearly of epidemiological importance.

THE INNERVATION OF DENTINE

FOR many years the destination of the abundant nerve-supply of the dental pulp has interested workers in dental histology. The extreme sensitiveness of dentine—so obvious both to dentists and their patients—made it seem likely that dentine possesses a nerve-supply. But the proof or otherwise of this by histological methods was far from easy, owing to the technical difficulties of preparing sections of hard and soft tissues in their normal relations. The late Howard Mummery,[1] a histologist of unsurpassed technique, after many years' patient work, claimed to have shown that nerve-fibres entered the dentinal tubules. In a later paper he described a layer of nerve-cells, just below the odontoblast layer, round which the nerves entering the pulp aborised; from these cells axons passed into the dentine and could be traced nearly up to the enamel. But this work, though it seemed to have solved the problem, has not passed unchallenged, and while some at least of Mummery's conclusions may be true, the general problem is still unsettled. D. Stewart[2] approached it from another angle. He severed the inferior dental nerve in a cat on one side and later compared the pulps of the teeth with those of the opposite side. He found that histologically the fibres which Mummery had assumed to be nerve-fibres showed no difference in their staining reactions from those on the normal side; he concluded that if they were nerve-fibres some change would be visible and that they must therefore be connective tissue fibres. But this work, significant though it be, does not take into account the possibility of some nerve-supply through the sympathetic fibres accompanying the blood-vessels. Another possible fallacy is that little is known of the changes in the staining reactions of non-medullated nerve-fibres after section of the parent axon, and an absence of any demonstrable change in fibres passing into the dentine might not necessarily mean that they were connective tissue fibres and not nerves. The latest contribution to the subject has been made by O. W. Tiegs[3] of Melbourne. Using the Bielschowsky method, he has examined the pulps of young molar teeth, and finds that from the deeper layers of the pulp nerves can be followed through the odontoblast layer into the subdentinal zone. These fibres pass as fine filaments under the dentine and often run for a considerable distance among the odontoblast processes, on which they terminate in definite end-organs attached to their surface. Nerve filaments may also end by minute swellings on the odontoblast cells. Tiegs was unable to find any evidence of the existence of nerve-cells in the pulp as described by Mummery, nor could he trace the fibres into the dentinal tubes. He concludes that the odontoblast cells must act as receptor organs for the nerve-endings, and that it is unnecessary to infer a special innervation of the dentine when the histological findings do not support it. It is to be noted that the odontoblast cells which according to Tiegs act as receptors of painful impulses, are mesodermal and not epiblastic. But on this point he remarks that there is no a priori reason why sense organs should be exclusively epiblastic; they are predominantly so because this layer is most likely to come into contact with the outer world.

The careful character of this piece of work and the excellent illustrations which accompany it make it an important contribution to an interesting though slightly academic subject. In the absence of any confirmation by other workers of Mummery's layer of nerve-cells in the pulp, this portion of his findings looks as though it must be abandoned as untenable. An examination of Mummery's original sections, now in the museum of the Royal College of Surgeons of England, leaves no doubt that whatever their nature the fibres which he demonstrated as passing into the dentinal tubes are not artefacts; though whether they are nerve-fibres as he assumed or whether they are connective tissue fibres remains uncertain.

[1] Microscopic Anatomy of the Teeth, London, 2nd ed., 1924.
[2] Jour. of Anat., 1927, lxi., 439.
[3] Ibid., 1932, lxvi., 622.

THE ÆTIOLOGY OF GOITRE

Colonel R. McCarrison's report to the Berne congress of 1927 summarised the knowledge of the ætiology of goitre at that time, but left many gaps to be filled. "The Life Line of the Thyroid Gland"[4] is a further memoir, written in association with Prof. K. B. Madhava, of Madras, which describes work done by the senior author during the past five years. Before further progress could be made in analysis of the factors which tend to produce goitre it was necessary, he says, to answer the question, What is the normal? The material of research was a stock of albino rats, living under such healthy conditions in the laboratory that for three years there had been no illness or death from natural causes. The thyroid gland was removed from large numbers of animals of this stock and was weighed, glands being taken from both sexes at different seasons of the year, some from those living a normal life and others from those sexually isolated. The figures thus obtained served as controls for further observations. Similar investigations were also made in pigeons, guinea-pigs, and rabbits, and this mass of accumulated data, together with previous observations on man and animals, was subjected to statistical study by Prof. Madhava and forms the basis of the present memoir. The conclusions reached are of no little interest. In early life, it is found, the normal thyroid gland grows more rapidly than the body as a whole, and it is then that it specially needs all the elements necessary for normal nutrition. The maximum weight of the thyroid relative to the body is attained just before puberty, and thereafter it gradually falls in both sexes, though in females there are secondary rises associated with reproduction. It is noteworthy that these results obtained in animals are in agreement with those of Percy Stocks for children, and that this normal enlargement of the thyroid gland at puberty is often mistaken for goitre in surveys of school-children. Of the influences which lead to goitre the memoir especially emphasises faulty diet. According to Colonel McCarrison a diet may be goitrogenic because it contains excess of certain substances normally present, such as fats, fatty acids, and lime; because it is deficient in certain substances such as vitamins A and C, or iodine, or has a relative deficiency of phosphates to lime; or, lastly, because it contains certain positive goitre-producing substances which are present in cabbage, ground-nut, bran, and maize, and possibly in certain other cereals. Lack of vitamin B

[4] Indian Med. Research Mem., No. 23, 1932. Published for the Indian Research Fund Association, by Thacker, Spink and Co., Ltd., Calcutta. Pp. 378. Rs. 12/12 (19s.).

is also possibly another cause. After diet, factors of importance are insanitary conditions of life which involve contamination of food and drink with excreta, and iodine insufficiency. The interaction of these three is complicated; for example, contamination of food and drink can only produce goitre when the diet is in some degree faulty, and this would explain why races living under the worst possible conditions of sanitation may entirely escape it. Similarly a low iodine intake, although favourable to goitre, almost always produces its effect in association with a diet which is also deficient in other respects. The effect of iodine-lack is most noticeable just before puberty when the demand for iodine is greatest.

PLAGUE IN EGYPT

FROM its situation as a half-way house between east and west, Egypt has been visited by more than its share of pestilences. There are many references to plague in the ancient Egyptian writings. The Israelites, in very early times, probably suffered from the disease, and later, some three thousand years ago, Sennacherib's army is said to have incurred severe losses from an outbreak, in which field mice played an important part. Rufus of Ephesus, the famous physician and historian, who lived two centuries B.C., also refers unmistakably to plague. In more recent times, three great outbreaks of plague are known to have occurred in Egypt as part of general pandemics; these are the subjects of a monograph by Dr. A. W. Wakil, assistant professor of hygiene and preventive medicine in the University of Cairo.[1] The first of the three was known as the plague of Justinian, which was supposed to have originated in Egypt in the sixth century. The second, which commenced in Asia and spread over the whole world as then known, reached its zenith in A.D. 1347; from its peculiarly fatal character, it earned the designation of black death. The third, believed to have originated in China, reached Egypt, presumably via India, in 1899. In the wake of each of these great outbreaks, a series of minor epidemics has occurred, but history has enabled us to define the first two pandemics with some precision, and the probabilities are that the third will die a natural death like them, accelerated, one may hope, by modern methods of sanitation and prophylaxis. It is now generally admitted that the real home of plague lies in central and northern Asia, and that the former tendency to saddle Egypt with the responsibility for the first two pandemics was unjustified. With regard to the third, the outbreak which is now petering out, there is of course no doubt that it was imported into Egypt from outside. A virulent epidemic occurred in the first part of the nineteenth century, but most authorities are agreed that after 1844 Egypt was completely free from plague until 1899, the year of the commencement of the present outbreak, which followed those in India and China. As soon as the disease obtained a firm footing in Bombay (1896), it was realised that extension to new areas could only be a matter of time, and many governments despatched research commissions to investigate on the spot. The Egyptian government was fully alive to the possibilities, and it was probably owing to measures recommended by their commission that infection of Egypt was postponed for some three years. It was in May, 1899, at Alexandria, that the first local case was discovered. The patient was a Greek, and the next 19 cases were of the same nationality—mostly living in or about groceries, wineshops, and bakeries. The mode of entry was not easy to ascertain, and the question is still a matter of controversy. The people affected did not live near the harbour, and dock labourers remained free for quite a long time. Rival theories at the time were that infection arose from used sacks, which were imported in large numbers from Bombay via Suez by rail, or from the baggage of Greek merchants, from Jeddah. As the primary outbreaks were of the bubonic type, it seems clear that infected rats must have obtained entry in some way. It is curious that Alexandria was affected before Suez and Port Said, and other places lying nearer to India. As a matter of fact Suez was not declared infected until 1904, though cases were discovered in Port Said early in 1900. Meanwhile the disease was spreading irregularly inland, especially in the thickly populated region of the Nile delta. The outlook was now very bad, and must have given rise to gloomy forebodings. In previous epidemics, plague had been extremely fatal in Egypt. Fortunately, in the present epidemic, the incidence has been extraordinarily low. The total number of cases registered during the thirty-two years of its duration is only 19,386. That the virulence has not been correspondingly slight is shown by the fact that deaths numbered 10,272. The largest total of deaths (1041) in any one year was in 1911, when the population was estimated at nearly twelve millions. Allowing for some fallacies in notification and diagnosis, the disease therefore has not exercised any considerable influence on the total mortality figures. It has been suggested that this comparatively small incidence may have been due to hereditary immunity of the rat population, following the last epidemic. But there are some other remarkable circumstances which cannot be accounted for in that way. Incidence of all types was five times greater in upper than lower Egypt, and the pneumonic form occurred about five times more frequently, in proportion, in the former than the latter; Cairo, contrary to expectations, has throughout been almost immune; and it is stated that not a single case of plague has been recorded in the various oases, nor in the Sinai peninsula, nor on the Red Sea littoral below Suez. It remains for research on biological, climatic, and other possible factors, which is still proceeding, to throw light on these and other problems.

[1] The Third Pandemic of Plague in Egypt. Published by the Egyptian University.

PEPTIC ULCER AND THE HYPOTHALAMUS

MENTION has been made in these columns[1] of Prof. Harvey Cushing's suggestion that functional derangement of the autonomic centres of the hypothalamus may play some part in the causation of peptic ulcer. In a more recent paper[2] he sets forth the circumstances which prompted this surmise. The neurogenic hypothesis of ulcer, as he points out, is by no means new. As early as 1841 Carl Rokitansky commented on the frequent association between gelatinous softening of the stomach and intracranial disease, and suggested that the vagus might be at fault. Rokitansky's views, however, though still taught in Vienna, were forgotten when his influence was supplanted by the less speculative philosophy of his successor, Virchow. Cushing's attention was directed to the question by the disturbing experience of losing three patients from acute perforations of the

[1] THE LANCET, 1932, i., 848, 1058.
[2] Surg., Gyn., and Obst., July, 1932, p. 1.

upper intestinal tract shortly after apparently successful operations for intracranial tumours. He describes these cases in detail, and refers to eight other instances in which various cerebral lesions were associated with pathological or clinical evidence of ulceration of the œsophagus, stomach, or duodenum. Further information about this curious association is mentioned by Prof. J. F. Fulton [3] in an interesting review of the functions of the hypothalamus. In the course of some experiments on animals, in which lesions were produced in the region of the supra-optic nucleus, it was noticed that several animals died obscurely from peritonitis. At the time this was ascribed to careless administration of the intraperitoneal anæsthetic, but A. D. Keller has subsequently shown that the peritonitis in such experiments is secondary to perforation of the stomach or duodenum. Finally, several workers have provoked similar lesions by injecting pilocarpine, a drug which exerts a well-known effect on the parasympathetic, into the cerebral ventricles and, in larger doses, under the skin.

It may justly be concluded, then, that the relation between cerebral lesions and acute ulcer of the stomach is more than mere coincidence. In discussing the possible corollary, that a functional derangement of the vegetative nervous system may be the cause of chronic peptic ulcer, both Cushing and Fulton wisely urge caution. It would be rash to jump to the conclusion that the neurogenic factor is the only one concerned. It must also be borne in mind that the precise connexion between multiple acute erosions and the usually solitary progressive ulcer is by no means fully understood. The available evidence is certainly not yet strong enough to justify speculative and dangerous operations on the nerves supplying the stomach in cases of gastric or duodenal ulcer.

THE USES OF LIPIODOL

LIPIODOL is a chemical compound of poppy-seed oil and iodine, containing 40 per cent. of iodine by weight, and is in many respects remarkably stable. On exposure to light, air, heat, or damp, however, it may deteriorate and turn from a pale amber colour to brown, which is due to the liberation of free iodine; this makes it both irritating and dangerous. It is to the use of this altered product that most of the complications reported after lipiodol injections have been due. Dr. J. Forestier and the late Prof. J. A. Sicard were the pioneers in employing lipiodol for diagnostic purposes, and now, just ten years later, their brilliant beginning sees a great fulfilment in the clinical and radiological survey which has appeared in English under their names.[4] No more striking illustration could be found of the advance of medical science during the past decade.

The broncho-pulmonary cavities were the first part of the body to be explored by Forestier and Sicard, following the partially successful results of Chevalier Jackson and others using bismuth powder or emulsions of iodoform; and in the diagnosis of bronchiectasis, intrathoracic new growths, and chronic empyema, for example, lipiodol has not only proved itself of immense practical value, but has given us much theoretical information about the pathology of these and other diseases. Its value therapeutically in respiratory disease is not perhaps so well known, but small quantities injected through the larynx after cocainisation act as a deodorant, lessen expectoration, and often seem to bring about considerable general improvement in chronic bronchiectasis, while in asthma also it is said to have been beneficial.[5] It should not be used in active pulmonary tuberculosis with pyrexia, especially if there has been recent hæmoptysis, or in extremely debilitated patients for whom the injection may prove too exhausting. The simplest method of injection for diagnostic purposes is probably by the crico-thyroid route, but for routine use Forestier prefers the intratracheal, though it requires greater experience.

Injection of lipiodol into the spinal subarachnoid space is of particular service in the localisation of spinal tumours, and among 37 laminectomies observed by Forestier the lipiodol diagnosis was incorrect in one only. The harmlessness of the substance is shown by its persistence in such a sensitive site as the subarachnoid space for years without signs of irritation or toxicity. Other uses of lipiodol in diagnosis are less widely known and at present less fully explored. In genito-urinary work other opaque substances such as uroselectan have a greater use, but in gynæcology lipiodol has given valuable information about the shape and size of the uterus and condition of the tubes. Of its employment in outlining the accessory nasal sinuses, the course of fistulous tracts, the position and dimensions of abscess cavities, and even the lacrymal ducts, a full account is given in this book. As a substance for injection into arteries lipiodol has the advantage of causing no pain, and it has proved helpful in cases of arterial obstruction, though conditions must be particularly favourable for results of any real assistance to be obtained. As a therapeutic agent lipiodol has been used in such conditions as chronic arthritis; Sicard and Forestier hold that "all the algesias considered to be idiopathic or rheumatic are amenable" to this treatment, but further work is probably needed before this use is established. All the references to this treatment are from French authors, which suggests that it has not been taken up in this country.

[3] New Eng. Jour. Med., July 14th, p. 60.

[4] The Use of Lipiodol in Diagnosis and Treatment. By Prof. J. A. Sicard and J. Forestier. London: Humphrey Milford, Oxford University Press. 1932. Pp. 235. 16s.

THE PATHOLOGY AND TREATMENT OF AGRANULOCYTOSIS

DURING the last ten years an increasing number of cases of severe oral sepsis associated with marked leucopenia have been recorded. They are described as agranulocytosis, or malignant neutropenia, since the outcome is usually fatal. The relationship of this condition to aplastic anæmia and purpura hæmorrhagica has lately been discussed by Graham Lescher and Douglas Hubble,[6] but their conclusions, so far as agranulocytosis are concerned, are unnecessarily pessimistic. Recent work has thrown much light not only on the pathology and therapeutics of this condition, but also on the mechanism by which the normal white cell count is maintained. It is clear that the symptom complex is not due to aplasia of the myeloid element of the marrow following severe sepsis since (1) the neutropenia may be periodic and definitely precede the appearance of local signs of infection; (2) biopsy and post-mortem studies show that in many cases there is a hyperplasia rather than an aplasia of myeloid elements. This finding led Fitz-Hugh and Krumbhaar [7] to suggest an arrest of development of the myeloid element—like the arrest of development of the red cell element

[5] Fink, L. W.: Minnesota Med., August, 1932, p. 522.

[6] Lescher, F. G., and Hubble, D.: Quart. Jour. Med., July, 1932, p. 425.

[7] Fitz-Hugh, T., and Krumbhaar, E. B.: Amer. Jour. Med. Sci., 1932, clxxxiii., 104.

in pernicious anæmia—as the pathological basis of the condition. The degree of hyperplasia clearly varies in different cases as it does in the megalocytic anæmias. Since Doan and his co-workers [8] had shown that nucleic acid and nucleotides, products of cellular breakdown, were powerful stimulants of myeloid activity in animals, Jackson [9] considered similar substances worthy of trial in a disease apparently due to failure of myelopoiesis. Last year he described a series of 20 cases of agranulocytosis, usually a fatal condition, in which there were 14 recoveries after treatment with nucleotide. Nucleotide might then be presumed to act in the same way as the effective principle in liver in pernicious anæmia—that is by enabling normal development to take place. Doan's[10] recent studies on the exact character of the white cell response to such treatment suggest further analogy with the response in pernicious anæmia. He found on analysing the different types of myeloid cell appearing in the blood after injection of nucleotide that the curve for the most immature myelocytes bore a striking resemblance to that for the reticulocytes after liver treatment. Since the degree of hyperplasia varies from case to case the degree of response is not necessarily constant. Doan suggests that blood transfusion and irradiation when effective may in reality act through the same nucleotide mechanism. He believes that disintegration products of senile cells are the important factors in maintaining the normal polymorph count; when therefore normal blood is transfused a certain amount of this stimulant to myelopoiesis, always present in healthy blood, is given to the patient, though probably this is sufficient only in rare cases. Irradiation acts by first exerting a destructive action and so liberating the essential factor.

This stimulating work should lead to more intelligent interest being taken in the innumerable differential counts that are necessarily done in the course of routine laboratory investigations.

RUDOLF KRAUS

THE death in Santiago de Chile of Prof. Rudolf Kraus has attracted little public notice, considering the importance of his work to bacteriology and the study of immunity. It was 35 years ago, when Kraus was 28 years old and assisting Paltauf in the Serum Institute at Vienna, that he demonstrated to the Vienna Medical Society the curious fact that if to a clear filtrate of a culture of cholera vibrios was added anticholera serum, flocculi soon began to appear in the mixture. This did not happen if typhoid was substituted for the cholera filtra. How specific this precipitation reaction was only became clear in the course of years during which precipitating antisera were prepared against a great variety of antigens of animal, vegetable, and bacterial origin. Kraus's discovery led up to Uhlenhuth's differentiation of proteins by specific biological tests and formed an essential link in Ehrlich's side-chain hypothesis, by means of which was built up most of our knowledge of the mechanism of immunity and of the wonderfully specific reactions shown by the serum of an inoculated animal. Kraus was born in Bohemia and studied medicine at Prague before settling in Vienna, where most of his early work was done. He was always a traveller, picking up information here, there, and everywhere. Having been to the Pasteur Institute as a student, later on he was entrusted with the prevention of cholera in the campaign between Bulgaria and Turkey, and just before the war he went out to found a bacteriological institute at Buenos Aires, where his house was a port of call for German science in South America. He directed a Brazilian institute for producing an antiserum against snake-bite, returning to Vienna in 1923 on Paltauf's death. About three years ago he left again for South America to take charge of the official serum institute in Chile. Kraus was one of the best medical writers of our time; wise, accurate, and clear. He edited, with Kolle and Uhlenhuth, the new edition of Wassermann's big handbook of pathogenic micro-organisms, and brought out, with Uhlenhuth, a handbook of microbiological technique. Amongst a host of papers on preventive methods these are the works by which he deserves to be remembered.

[8] Doan, C.A., Zerfas, L. G., Warren, S., and Ames, O.: Jour. Exp. Med., 1928, xlvii., 403.

[9] Jackson, H., Parker, F., Rinehart, J. F., and Taylor, F. H. L.: Jour. Amer. Med. Assoc., 1931, xcvii., 1436.

[10] Doan, C. A.: Ibid., July 16th, 1932, p. 194.

THE BRITISH ASSOCIATION

THE British Association for the Advancement of Science begins its second century, like its first, with a meeting at York. The present fashion for retrenchment has fortunately not affected the programme, which once again surveys the widening field of scientific endeavour. As the workers in this field become further and further separate, it grows more difficult for the organisers of these meetings to ensure that they shall provide a good harvest for the Association's members as a whole, and for the intelligent public. This year the aim has clearly been to group the communications in the various sections under definite and broad headings—to gather the labourers into groups—and this is a wise plan which will certainly prove profitable. From the point of view of medicine it is regrettable that the section of physiology will have no meeting. The reason is, of course, not lack of interest, but the simultaneous holding of the fourteenth International Physiological Congress at Rome. The section of psychology includes in its arrangements a joint discussion with the section of mathematical and physical science on the quantitative relation of physical stimuli and sensory events. There will also be papers and discussions on clinical psychology, the psychology of acquired characteristics, learning and instinct, visible and auditory phenomena, and industrial psychology. In the section of educational science close attention will be given to the equipment and scope for science teaching in schools; while the section of geography includes among many other topics the British spas. There is, indeed, hardly a section which will not touch somewhere on the fringes of medical studies—evidence of the increasing catholicity of medicine.

The meeting starts on August 31st, when Sir Alfred Ewing, F.R.S., will give his presidential address, entitled An Engineer's Outlook.

SODIUM AMYTAL IN ECLAMPSIA

IN a recent annotation (p. 300) we mentioned that sodium amytal is one of the barbiturates now being tried in eclampsia. E. L. King, G. A. Mayer, and T. B. Ayo [1] claim, after using it in 30 cases of ante- and intra-partum eclampsia, that it is a safe and hypnotic sedative with marked anæsthetic properties when given intravenously. Their routine treatment is as follows:

(1) On admission morphine sulphate gr. ¼ is given hypodermically, this dose being repeated if necessary in case of slight or moderate restlessness.

[1] Amer. Jour. Obst. and Gyn., 1932, xxii., 867.

(2) Sodium amytal grs. 7½ is given intravenously. If the convulsions recur, or if there is marked nervous irritability, this dose too may be repeated as often as required.
(3) As soon as the full effect of the amytal is obtained the stomach is washed out, and 2 oz. of 50 per cent. magnesium sulphate is given through the stomach-tube.
(4) If there is marked hypertension, 300 to 400 c.cm. of blood is drawn off from a vein, and through the same needle 1000 c.cm. of 10 per cent. solution of glucose is administered without insulin; this treatment is usually repeated in 24 hours.
(5) At a convenient time a soap-suds enema is given—more than once if need be. This is eliminative, and prepares the rectum for the rectal administration of more sodium amytal if thought proper.
(6) Thereafter, sodium amytal in grs. 3 doses is given by mouth or by rectum every four hours. Its administration is continued until it is felt that all danger of recurrence of the convulsions is past, usually in 36–48 hours.
(7) Only water or a glucose-and-water mixture is given by mouth or by stomach-tube until the patient is fully conscious, after which a light diet rich in carbohydrates is allowed.
(8) If there is œdema of the lungs, atropine sulphate gr. 1/50 is given hypodermically and repeated as necessary.
(9) If labour does not supervene spontaneously it is induced by catheter or bag. This proved necessary eight times.
(10) Labour is usually allowed to terminate spontaneously, but low forceps is used occasionally.

The writers lay stress on two important points in the administration of the amytal. First, no solution should be used which is not absolutely clear for four or five minutes after its preparation, and, secondly, the rate of intravenous injection should not exceed 1 c.cm. per minute. After the first dose the fits are promptly suppressed, and a prolonged quiet sleep follows. A remarkable side effect is the rapid fall in blood pressure, which, however, soon rises again, though not to the same level. In the 30 cases there were three deaths.

E. C. Hamblen and D. O. Hamblin[1] advise the use of sodium amytal by the mouth in eclampsia. Each patient on admission is given grs. 15–18 in capsule; if she cannot swallow, it is administered by nasal catheter. Thereafter, if there is restlessness or if the blood pressure is high, grs. 3–6 is given, approximately four-hourly, for 24–36 hours. After the administration of grs. 30–45 at increasingly wider intervals, it was found that a deep sleep could be maintained by 3-grain doses. Hypertonic glucose was given intravenously to each patient in amounts sufficient to establish satisfactory diuresis and to combat any tendency toward acidosis. In 14 cases in which the method was used the convulsions were controlled immediately by the initial dose of sodium amytal and did not recur. No other narcotics or sedatives were employed, and all the patients recovered. The babies were in good condition at delivery and required no vigorous resuscitation. The authors believe that the preparation is worthy of a more extended trial, especially as the treatment is so simple that it can be readily carried out in the patient's home. It is necessary to add, however, that an experience of oral administration rather less favourable has been recorded by G. L. Watt, of Toronto,[2] after its use in four cases. In one the fits were not controlled and the patient seemed to derive little or no benefit from the amytal, though she ultimately recovered. Another patient who had massive œdema, high blood pressure, and albuminuria, but no convulsions, was, during her labour, given amytal grs. 9, and later grs. 6, by mouth, in order to relieve her pains. Immediately after delivery she developed anuria, became comatose, and died with uræmia. Though Watt exonerates the amytal he feels that it should not have been used, for the patient was quiet and had no convulsions. He afterwards used it intravenously in seven cases of eclampsia and all recovered.

Although, therefore, experimental evidence has failed to show that the drug has any toxic effects on the viscera, a fatal case such as the above should lead to caution in its use. Much more experience is necessary before the new remedy can be pronounced altogether safe or reliable.

[1] Amer. Jour. Obst. and Gyn., 1932, xxii., 590.
[2] Canadian Med. Assoc. Jour., July, 1932, p. 53.

INTERMITTENT HEADACHE IN WOMEN

Dr. A. P. Thomson described in our columns[1] a few weeks ago a type of headache which many practitioners must have encountered and been unable to understand or cure. It is found in women and associated with the menstrual period, but is very different from the ordinary headache of fatigue or slight toxæmia which may be present at this time. It is a severe bursting pain, felt more or less all over the head but sometimes concentrated in one or other brow; patients often add that the pain is "blinding" or affects their sight; it is usually associated with nausea, but seldom with vomiting. Menstruation may be scanty or excessive, but is regular. Dr. Thomson was convinced of the severity of the pain; indeed, had he not known their history, he says, he would have suspected some of his patients of serious intracranial lesion. With the radiological help of Dr. C. G. Teall, however, he has been able to relate the headache to abnormal ossification around the pituitary body, and his explanation of the pain is that the pituitary is enlarging in a limited space. Certainly the subjective feeling of the patient fits this explanation extremely well. Knowing that in animals the administration of the ovarian follicular hormone (œstrin, folliculin, theelin) reduces the size of the pituitary body, Dr. Thomson tried this method of therapy, and records success in a fair proportion of 25 cases treated with theelin, three injections of 50 rat units being given in the week before the headache is due.

From Canada now comes a report by Dr. N. H. Blakie and Dr. J. C. Hossack,[2] who have treated a number of cases of so-called migraine with emmenin (J. B. Collip's œstrus-producing hormone derived from placenta). Their patients were all married women whose headaches appeared just before menstruation or were very much worse at that time. The Canadian workers do not seem to have associated the condition with the pituitary, and their treatment was empirical, suggested by the association of the headaches with abnormal ovarian function. The preparation of emmenin used was given by mouth, and further evidence of the clinical value in such cases will be required.

[1] THE LANCET, July 30th, p. 229.
[2] Canad. Med. Assoc. Jour., July, 1932, p. 45.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION.—A special week-end course in clinical surgery will be given at the Royal Albert Dock Hospital, on Sept. 3rd–4th. Special reference will be made to the relation of technique and end-result, as judged by the period of disability in the shipping industry. An all-day course in diseases of the chest, will be held at the Brompton Hospital from Sept. 5th to 10th, and a course in psychological medicine at the Bethlem Royal Hospital on Tuesdays and Fridays at 11 A.M., from Sept. 6th to 30th. Individual clinics at various general and special hospitals in London are available daily to members. Further particulars may be had from the Fellowship, at 1, Wimpole-street, London, W.1.

SPECIAL ARTICLES

WHAT IS WRONG WITH THE MEDICAL CURRICULUM?

(A Series of Opinions Contributed by Request)

XI

By F. B. Byrom, M.D., M.R.C.P. Lond.

BEIT MEMORIAL RESEARCH FELLOW; LATE DEMONSTRATOR IN PHYSIOLOGY, AND MEDICAL FIRST ASSISTANT, LONDON HOSPITAL

The shortcomings of the curriculum are brought home most forcibly to the student in the early years of his post-graduate career when he first attempts to put precept into practice. My own experience has been long enough to have brought me into contact successively with the main branches of clinical medicine, teaching, and research. At the same time it has been short enough to have left unimpaired the memory of my early impressions, and upon these I have based the comments which follow.

ANATOMY

I take it as agreed that any appreciable lengthening of the curriculum is undesirable and that a certain amount of destructive criticism is permissible. With this licence it is perhaps natural that I should refer first to anatomy, the study of which subject probably entails as much intense mental application as the rest of the syllabus put together.

The ideal of the anatomist is to create, not doctors, but anatomists.

The medical student is expected to transfer the dead leaves of Cunningham, one by one—from the first to the last—to the folds of his cerebral cortex, with complete disregard to the possibility that some of the leaves may hold more useful information than others. The small muscles of the back of the neck must be memorised as faithfully as the small muscles of the hand, the course and branches of the internal maxillary artery as those of the internal carotid, the meanderings of the lumbar veins as the course of the external jugular, the petrosal as the oculomotor nerves. So exacting are the demands of teachers and examiners, and so plastic is their clay, that at the end of 18 months the conscientious student may be, for a brief spell, word-perfect enough not to disgrace a professorial chair in anatomy. But the catechism is so exhaustive and impartial that it defeats its own ends; for, as soon as the student escapes into the wards, it begins rapidly to fade from his memory, and, as often as not, the important fades more quickly than the trivial. He may, for instance, know his lumbosacral plexus as faithfully as the signalman knows his plexus of railway lines, and yet retain but the haziest notion of the segmental innervation of the trunk and limbs.

The teaching of anatomy requires revision in more ways than one. In the first place a certain amount of unimportant detail might safely be omitted. Taking a leaf from Gilbert, I would commission a clinical Koko to compile a little list of insignificant structures with long names, which would only be missed by the purest of pure anatomists. The intending general practitioner would be none the worse for such an abridged syllabus. The minority who later decide to restrict more narrowly the field of their activities would be required to pass additional examinations. The surgeon, I presume, would still require a fairly exhaustive knowledge of the subject. In the case of the physician, on the other hand, attention would be concentrated on the nervous and vegetative systems, to the exclusion of such things as the finer points of osteology and the details of fascial planes.

The most radical pruning would admittedly leave a still formidable catalogue of essentials. The memorisation of this, however, would be made vastly more easy and more interesting if anatomy were regarded, and taught, as a study of the quick rather than the dead. At present the student pays too much attention to individual muscles and too little to the movements in which they are collectively concerned. More heed might also be paid to the fact that the visual image is more enduring than the list of facts acquired by rote. The anatomist should ally himself to the radiologist. The tiresome list of the ages between which epiphyses unite with diaphyses means nothing to the student and is one of the earliest things to be forgotten. If it were illustrated by selected radiograms of the growing skeleton, not only would it assume some significance in his mind, but he would also be less liable to fall, later, into the common error of diagnosing a separated epiphysis where none exists.

I would not dispense with an hour of the time devoted to dissection, but the unravelling of the hardened abdominal and pelvic viscera of the shrunk cadaver yields a poor understanding of the shape and position of these organs during life. Here again is scope for the intelligent application of radiology.

There is also room for improvement in the teaching of embryology. It is by no means easy to master the progressive evolution of the embryo by contemplation of a series of static diagrams or models. Why not supplant the dead lantern slide by the living cinematograph and present the evolution of, say, the eye as a convincing moving picture?

PHYSIOLOGY

With the teaching of physiology I have less fault to find. The growth of this science has been so rapid, and the developments capable of practical application to medicine have come from such unexpected quarters, that it is no longer pertinent to regard physiology as the handmaiden of medicine.

It is surprising, in view of the simultaneous demands of the anatomist, that the student learns as much physiology as he does. It is true that at present he is taught too much about some of the electrical phenomena attendant on the activity of muscle and nerve and too little about biochemistry, metabolism, and the normal cytology of the blood. But the wisdom of attempting to restore the balance by the early teaching of "applied physiology" is open to question. I have had some personal experience, as a clinician, of teaching certain sections of physiology to students in the preclinical years. It is easy to enlist attention, but I have never been free from the suspicion that it is the clinical instances which are assimilated rather than the physiological principles to which they are designed to give point. It is perhaps merely stating the obvious to insist that the physiologist is alone competent to teach the *principles* of physiology, and that the aid of the clinician should be invoked sparingly and late. The scope of physiology is so wide and its frontiers are so changeable that the examining boards are fortunately unable to insist on an exhaustive knowledge of the subject. In this respect the physiologist has the advantage of

the anatomist and, if he is in sympathy with the medical student, it should not be impossible to steer the middle course between the purely academic and the simply utilitarian.

One strange anomaly about physiology deserves comment. It is concerned not with the physiologist himself but with the attitude of the examining bodies for the higher qualifications in medicine, as distinct from surgery. The surgeon, at any rate in England, is required to pass a searching preliminary examination in physiology. The physician, on the other hand, can obtain the highest qualifications with little more than a nodding acquaintance with the subject on which, above all others, the rational advance of his art depends. If this paradoxical order were reversed medicine would gain far more than surgery might lose.

MATERIA MEDICA

The art of elegant, perhaps even of competent, prescribing appears to be waning. It received a mortal blow when the teaching hospitals and, later, the insurance committees, encouraged their medical staff to employ stock mixtures. But it is also an earnest of the more fundamental transition of therapeutics from the empirical towards the rational. I see little cause, apart from sentiment, to deplore the decay of the art. It is tending more and more to focus the attention of the clinician on the few drugs which are really valuable, and it therefore offers a pretext for relieving the student's burden by an onslaught on the more obsolete weeds of the pharmacopœia.

CLINICAL TRAINING

In his final years the student is permitted to relax a little from his text-books and to absorb wisdom by the more natural use of his senses and his wit. He can, if he will, learn a great deal from his close association with the unrivalled array of clinical material which surrounds him in the wards. But it is a peculiarly limited array. It consists, broadly, of the hopeless rather than the treatable, the inevitable rather than the preventable, the structural rather than the functional, the rare rather than the common. In this atmosphere he tends to become preoccupied with the detached diagnosis of the late structural results of disease, with the post-mortem room as the final court of appeal. He is acquiring a knowledge not so much of clinical medicine as of applied morbid anatomy—an indispensable part of his training, but by no means adequate to equip him to practise medicine.

How pitifully inadequate it is he begins to realise when he obtains his first post-graduate appointment as, say, a clinical assistant in a medical out-patient clinic. Here, it is true, he will recognise the occasional case of established organic disease, and will have little difficulty in inserting it into its appropriate pathological pigeon-hole. He will also soon learn to recognise, though not to understand, the frank neurotic and the hysteric. But the bulk of his patients fall between these two extremes. Their symptoms are legion. They complain of headache, of giddiness, of stiff aching limbs, of backache, of indigestion. He examines them with his mind alert for evidence of cerebral tumour, of disseminated sclerosis, of Pott's disease, or of abdominal cancer, and he is disconcerted to find no abnormal physical signs whatever. After a while the neatly arranged tiers of pathological specimens which have formed his clinical horizon come tumbling down, and he looks beyond into the strange new world, in which he is destined to spend his professional life.

This medley of disorders defies precise tabulation. It includes primary neuroses, neuroses originating in trivial but persistent organic disease, functional vegetative disorders—e.g., the dyspepsias,—organic diseases devoid of gross structural changes—e.g., many varieties of "fibrositis"—and, finally, the early stages of progressive structural disease. Confronted by such material the newly qualified man is helpless. He has been taught far too little about "minor" ailments, and the curriculum is innocent of any serious instruction in clinical psychology.

A somewhat similar lack of proportion is evident in the teaching of surgery. It is difficult to believe that the student can reap much profit from the long hours of standing in the operating theatre, while the surgeon is engaged in major operations which he himself is not likely to be called on to perform. Surely the post-graduate student would be willing to relieve him of some part of this burden and allow him to devote a little more attention to those sections of minor and casualty surgery, such as infections and injuries of the hand, the importance of which, both to himself and to his patient, can hardly be overstated.

In the special departments of surgery and medicine again, the teacher, like the anatomist, is prone to cover the whole range of his subject without sufficient emphasis on the common and important. Consequently, when the student commences practice, rarities like mycosis fungoides, Gradenigro's syndrome, and buphthalmos, loom as large in his mind as impetigo, otitis media, and corneal ulcer.

SPECIALISM AND ITS ANTIDOTE

It is easier to indicate the weaknesses of the present system of clinical training than to prescribe the remedy; and they are not entirely the fault of the teacher. Indeed, the path of the consultant-teacher in *general* medicine becomes harder every day. In the out-patient department he has the difficult task of combining the investigation of his patient with the instruction of his class. In the purely clinical past this no doubt served its purpose, but in the more technical present it demands an encyclopædic memory if the teacher would prevent his students from comparing him unfavourably with his specialist colleagues. And in the still more technical future it seems inevitable that he will be driven to specialise himself.

I have no mind to belittle specialism. It is at once cause and effect of the advances which have occurred in medicine in recent years. But the specialist, in his zeal for the interesting, is prone to ignore the commonplace, and his student find it increasingly difficult to maintain the broader outlook which is essential to the general practitioner. In the United States, for instance, precocious evolution of specialism, however much it may have fostered clinical research, has had the unfortunate effect of turning one-half of the younger generation of doctors into specialists—of a kind. (I quote the estimate of an experienced American physician.)

In attempting to forestall a similar outcome in this country it is necessary to accept the further development of specialism as inevitable and, on the whole, desirable. To attempt to regain the older standards of general clinical teaching therefore is merely to swim against the tide. Is it possible, then, to turn about and, swimming ahead of the tide, to seek to fill the needs of the general practitioner by creating a new type of consultant teacher, a specialist in minor and functional ailments and in the early stages of

disease? I do not think that such an ideal, a specialist in the general, could be translated into flesh and blood. It would be extremely difficult to define the scope of a man whose activities would touch so many fields and who would be neither wholly physician nor wholly psychologist. And it is asking too much of a man to expect that his interest in his patient shall evaporate as soon as abnormal physical signs appear.

I submit that a solution could be found without any radical alteration of the present order of things. A considerable proportion of the common and functional complaints to which I have referred fall within the orbit of this or that specialist. The latter must surely encounter such patients in his private practice, for their complaints are real and disabling enough to call for a second opinion. And sufficient teaching material trickles into the various out-patient departments, if he cares to look for it. If he will bestir himself to use this material and to lose no opportunity of stressing the difference between the important and the merely interesting, the problem will be half solved. All that will remain will be to ensure that the student shall be well grounded in the elements of medical psychology. How and where this may be best accomplished I must leave to the combined wits of the physician and psychologist. In the ordinary out-patient clinic pressure of work and lack of privacy combine to discourage the neurotic from unburdening his troubles. In the medical wards the student has better opportunities—certainly better than those of his chief—of gaining his patient's confidence, but he needs to be shown how to make use of these opportunities. The most serious defect of the present system of clinical training, a defect which fills the consulting rooms of the quack, is that it sends the student into a neurotic world devoid of anything which will help him to understand and disentangle the tortured fancies of the mind.

MEDICINE AND THE LAW

Prosecution of Unregistered Dentist

ON July 27th Horace George Osborne, of Linton-street, Islington, was summoned at the North London Police-court for having practised dentistry without being a registered dentist. The offence was proved by a former patient of the defendant, who gave evidence that his dentures slipped, and that he went to Osborne who took an impression of his mouth. The defendant was able to show that the Dental Board had persuaded the patient (who otherwise intended to go elsewhere) to go to Osborne, and had suggested to the patient that he should put pressure on Osborne by saying that, if Osborne did not do the work, he would go elsewhere and send Osborne the bill. The magistrate said an offence had been committed, but under pressure applied by someone acting for the Dental Board. He fined Osborne 2*s*. only, to mark his feeling that the conduct of the prosecution was unfortunate.

The case illustrates the difficulty of bodies whose business it is to enforce the law. They must be prepared to prosecute, and for this purpose must have evidence. Just as an inspector makes purchases for the purposes of prosecuting offences under the Food and Drugs Acts or early-closing legislation, so a body like the Dental Board or the Pharmaceutical Society must take steps to see that adequate evidence is forthcoming in a case where prosecution is proper. The use of test packets in order to trap a dishonest postman is a similar process. The method fosters a certain sympathy towards the postman, but the Post Office is often aware of a series of suspicious occurrences, and takes the only possible step to enforce the law.

IRELAND

(FROM OUR OWN CORRESPONDENT)

THE SWEEPSTAKES FUNDS

THE authorities of many of the hospitals entitled to share in the results of the sweepstake on the Manchester November Handicap have been urging on the Minister for Justice that he should as far as possible speed up the distribution of the funds. The Minister was unable to take any step until he received and considered the report of the committee of reference, and bearing in mind the work this body had to do in investigating and comparing the claims of the several hospitals, it cannot be said that it was dilatory in its work. The report of the committee, however, reached the Minister some three months ago, and unless the Minister thinks it necessary to conduct a fresh investigation, or to differ radically from the recommendations of the committee, there seems to be no reason why he might not ere now have made his order and permitted the distribution of the funds. It is expected, however, that he may come to a decision very soon. There was, of course, no justification for the suggestion which found currency last week that the Government of the Irish Free State had some design of tampering with the funds, and that the delay in distributing the money was due to an order of the Government. A specific denial of this rumour has been made by the Minister for Finance, acting under the instructions of the President of the Executive Council.

BUCHAREST

(FROM OUR OWN CORRESPONDENT)

REGISTRATION OF FOREIGN PRACTITIONERS

A LAW has been passed declaring it to be illegal for anyone who is not a member of the College of Medicine to practise in Rumania. As only a Rumanian degree can automatically confer the right of admission to this body, there are certain formalities which must be observed by foreigners. They must present their matriculation certificate and their degree diploma, together with a fee, to the board of the medical faculty of one of the four universities. Once this board has satisfied itself that the documents are in order, it proceeds to examine the candidate in two or three of the principal subjects of the curriculum, and if the candidate is successful he then receives the desired certificate of recognition. In Bucharest itself, however, the candidate has to sit a second examination, set by a committee specially appointed by the Ministry of Health, on three other branches of medical science. The successful applicant must give due notice of his acceptance in the official gazette. He will then receive the "libera pratica" and is duly elected to the College of Medicine. The whole procedure takes about six weeks.

TAX ON IMPORTED PROPRIETARY MEDICINES

A duty of 5 lei per bottle or box has been imposed on all proprietary medicines coming from abroad. There is also a prescription tax, of 5 lei per

prescription, and both forms of revenue are collected through the post office, where special stamps are sold. These must be affixed to the labels of all proprietary medicines and to all prescriptions.

DISEASE AND DIVORCE

Dr. P. G. Samarian devotes a chapter of his history of medicine in Rumania to the diseases which formerly served as grounds for divorce. At the beginning of the eighteenth century insanity and certain contagious diseases—notably syphilis, frambœsia, and leprosy—were regarded as sufficient reason for divorce in all the Rumanian principalities, while the legislation of the seventeenth and eighteenth centuries permitted the dissolution of marriage on the grounds of homosexuality or habitual drinking, and also in epilepsy if this was present before marriage and concealed from the other contracting party. Divorce was also granted on the grounds of impotence. In 1815 the Prince of Walachia passed a decree recognising phthisis as ground for divorce among the nobility. The law as it stands at present does not allow divorce for any disease.

A SPECIALIST'S BILL

A court in Bucharest has decided that there are limits to the demands which may be made on the professional discretion of a doctor. A specialist was treating a married couple for syphilis when the husband was killed in a motor accident. The widow continued to undergo treatment most conscientiously for several years, and was finally declared to be cured and non-infectious. Some time later she became engaged to be married again, and having been previously unable to pay all the fees she owed, she agreed to pay the balance on her remarriage. This she was unable to do, because her second husband was too economical; he wanted to know about all the money she spent, and she could spare nothing for this secret debt. After waiting more than a year the doctor sent his bill to her. His notepaper only bore his name and address, but by chance the letter was handed by the postman to the husband, who knew the doctor by reputation. He tormented his wife with his inquiries so long that she confessed the truth, and the resultant quarrels ultimately led to a divorce. She regarded the doctor's letter as the only reason for her plight, and she sued him for compensation, arguing that his indiscretion caused her husband to divorce her. The court refused her claim, arguing that a venereal specialist is entitled to notepaper bearing his name; in this case he did not even state on the notepaper that he was a venereal specialist. The plaintiff knowing that she owed him money ought to have been prepared to get a bill sometime, and the doctor could not be blamed when he had waited a year before sending it.

PUBLIC HEALTH SERVICES

ANNUAL REPORTS OF MEDICAL OFFICERS OF HEALTH

THE following are 1931 statistics of three urban and four rural districts:—

Name of district and estimated (R.-G.) mid-year population.	Birth-rate.	Death-rates per 1000 of the population.					Death-rates per 1000 births.	
		All causes.	Tuberculosis.	Cancer.	Respiratory diseases with influenza.	Heart disease.	Infant mortality.	Maternal mortality in childbirth.
Doncaster R.D. (49,680) .	23·1	9·1	0·96	0·76	1·8	1·0	81	5·2
Adwick-le-Street U.D. (20,620).	22·4	8·2	0·53	0·73	2·1	0·8	67	2·2
Barnstaple R.D. (18,090).	14·1	13·4	0·61	2·10	1·3	3·2	41	0·0
Paignton U.D. (17,730).	10·2	14·5	1·19	2·09	2·7	3·2	61	5·5
Ilfracombe U.D. (8685) ..	9·9	16·3	1·38	2·19	2·1	3·8	70	11·6
Thedwastre R.D. (8031) ..	13·7	15·8	1·12	2·87	1·4	5·4	27	9·1
East Stow R.D. (7255) ..	14·5	10·5	0·85	2·28	1·4	1·7	9	19·0

Registered stillbirths per 100 live births: Doncaster 3·8, Adwick 4·3, Barnstaple 3·0, Paignton 7·2, Ilfracombe 7·0, Thedwastre 6·4, East Stow 3·8.

Doncaster and Adwick-le-Street

Dr. A. B. Dunne reports for these districts, the councils of which are both members of the Doncaster Regional Town Planning Committee.

In the rural district progress has been made with water-supplies and the drainage of cesspool areas. The only new houses are villas near Doncaster borough, but the council have decided to erect 16 parlour and 24 non-parlour houses at Askern. No house has been added to the colliery villages of Armthorpe, Edlington, and Rossington.

In the urban district the workmen of the two collieries, Brodsworth and Bullcroft, maintain voluntary nursing associations. Difficulty has arisen with the softening of the hard (38 degrees) water from the limestone, and arrangements have been made with the Doncaster Joint Water Board for a bulk supply from a sandstone boring yielding water of a total hardness of 12 degrees. Housing conditions are good. Building has ceased for the time being; 90 per cent. of the houses are less than 20 years old.

In the rural district 2442 cows were examined by the West Riding veterinary staff and 51 cows and heifers were slaughtered under the Order, 16 of which showed signs in the udder; in the urban district 92 cows were examined and two slaughtered under the Order.

The worst feature in both districts was the prevalence of cerebro-spinal fever. In the Riding there were 608 cases with a case-fatality of 51·3 per cent. In Doncaster (R.D.) there were 76 notifications and 37 deaths. The male cases were 44, the female 32; 20 were of pre-school age, the youngest being four months; 28 were of school age and 28 above school age, the oldest being 61. The cases were distributed in 16 parishes, but 34 and 18 respectively occurred in the colliery villages of Edlington and Rossington. Cases occurred in every month, the fewest being in January, July to October, and December. Five cases died before they could be removed to hospital. In Adwick (U.D.) there were 20 cases (16 male, 4 female) and five deaths. Three were under, eight of, and nine over school age. In the West Riding experience the notification of a second case in a house is an extremely rare occurrence. The procedure adopted was immediate hospitalisation and serum treatment of the cases, and for the contacts antiseptic gargles, throat lozenges, inhalations, &c., and advice as to fresh air, avoidance of overcrowding, &c.

Barnstaple

Dr. J. R. Harper says influenza was rife during the spring and particularly prevalent during the last few months of the year. Pneumonia was a commoner complication than in previous years and six deaths were recorded from influenza. There is no isolation hospital in the district, but an Order of Jan. 1st, 1932, sanctioned the building of an isolation hospital to serve Barnstaple, Bideford, Torrington, Northam, and Holsworthy. District nursing is done entirely by local subscription and there are still some parishes without a district nurse. The county laboratory

has been widely used by medical practitioners throughout the district. The Housing (Rural Workers) Acts have been well used in Devon as a county and Barnstaple rural district has used the Acts more than any other part of the county. Up to Feb. 29th, 1932, approved applications totalled 110 and on April 1st 37 more applications were under consideration. During 1931 the council began a housing scheme for the erection of houses in 21 parishes. Tenders have been let for 42 houses in seven parishes. Rents will be 7*s.* per week for the parlour type and 4*s.* per week for the non-parlour type, exclusive of rates.

Paignton

Dr. R. Julyan George says there is a 36-bed general hospital with special departments for ear, nose, throat, and eyes, and also equipment for X rays, electrical treatment, and massage. He complains that too many beds are occupied by accidents affecting non-residents. The one midwife and the two Queen's nurses take part in the work of the maternity and child welfare centre. Seventeen expectant mothers attended the antenatal clinic.

A long overdue reform has been adopted. The surveyor makes the connexions of drains to the sewers which were formerly made by private builders. A local haulier was fined £2 for carrying meat in a dirty lorry without the meat being properly covered. The council is in a fair way to closing the private slaughter-houses. The only licensed one has been bought and adapted for a public slaughter-house. Of the two registered slaughter-houses, one will be abolished by a street-widening scheme.

Samples of milk examined under the county scheme for cleanliness numbered 35 and for tubercle nine. Of the former, four out of 25 produced in the district and three out of ten produced outside the district were graded "bad." One of the nine samples gave a positive result for tubercle. The collection of refuse is by mechanical transport and "controlled tipping" has been adopted for its disposal.

The council built 13 houses at Collaton during the year forming part of a scheme of 24. The waiting list for council houses numbering up to 700 has been ruthlessly pruned, and when the remaining houses at Collaton are finished the waiting list will number 20. A custom has apparently arisen of moving out of a rented house and overcrowding one or two rooms so as to qualify for a council house.

The hours of bright sunshine were 1454·6, which is 254·5 hours below the 21 years' annual average. The rainfall was 36·86 inches, which is 0·92 inch below the 21 years' average.

Ilfracombe

Dr. D. C. Adam says there is an isolation hospital and a cottage hospital with a modern X ray equipment, each sufficient for the ordinary needs of the town and neighbourhood. Difficult maternity cases are sent by the county council to the North Devon Infirmary at Barnstaple and orthopædic cases to the clinic at Barnstaple. The county council is the maternity and child welfare and the midwives supervisory authority.

The water-supply is from moorland gathering grounds on Exmoor conveyed to covered reservoirs at Ilfracombe by an aqueduct and pipe line 14 miles long. Owing to its lead-solvent action, lead pipes are prohibited for its distribution. Of 100 milk samples examined for cleanliness 28 were up to the Certified milk standard, 34 to the Grade A standard, whilst 22 were graded as "bad." The council owns a public abattoir, but nevertheless there are three private slaughter-houses undesirably situated near the centre of the town and in close proximity to dwelling-houses. The animals slaughtered at the public slaughter-house totalled 4753, whilst those slaughtered in the private slaughter-houses totalled 2272. The hours of bright sunshine were 1341·7 and the rainfall was 41·33 inches.

Thedwastre and East Stow

Dr. S. C. Hounsfield is the medical officer of health (part-time) of these two districts which jointly with Stowmarket (U.D.) own an isolation hospital (22 beds), also available for use by neighbouring councils. In both districts nurse-midwives are supplied by the County Nursing Association to parishes grouped for the purpose.

In Thedwastre there are 20 villages and no large estates, the district being mainly divided into small farms. Dr. Hounsfield describes very primitive sanitation. Half the houses are without drains and the other half drain into ditches or streams. The only two so-called sewers drain into ditches. There is no scavenging and it is quite common to see heaps of refuse and night soil in the small back gardens of cottage property within a few feet of door and windows. "A number of cottages get their water from springs, ponds, ditches, field drains, &c." In two parishes they "have to walk over a quarter of a mile for drinking water." The council has built 116 houses, eight within the last year and 14 more are in course of erection. Houses at low rentals are needed in nearly every village. Many of the cowsheds are dirty, but "the dairies with two exceptions were found very clean." There are 11 slaughter-houses in use and a bacon factory. Trouble was caused by the failure of butchers to notify their intention to slaughter. At the factory 16,018 pigs were slaughtered and after examination 1029 tuberculous heads and 78½ carcasses were condemned. The sanitary inspector holds a certificate for meat and food inspection and inspection of meat occupies most of his time—"at least four days of each week." Dr. Hounsfield sums up: "Sewerage schemes for all the larger villages and water-supplies for the whole area are problems which should be tackled, but which at present appear insoluble on account of the expense."

In East Stow the water-supply is chiefly from wells and ponds, but the council's waterworks supplies populous areas by piped mains and standpipes. An additional reservoir will be completed in 1932. The sewage farm owned jointly with Stowmarket is unsatisfactory and is to be reconditioned at a cost of £10,000. Dr. Hounsfield thinks that, considering all the circumstances of a rural district, East Stow is making as good progress as can be expected.

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED AUGUST 6TH, 1932

Notifications.—The following cases of infectious disease were notified during the week:—Small-pox 25 (last week 19); scarlet fever, 1285; diphtheria, 591; enteric fever, 63; acute pneumonia (primary or influenzal), 456; puerperal fever, 38; puerperal pyrexia, 103; cerebro-spinal fever, 25; acute polio-myelitis, 11; acute polio-encephalitis, 1; encephalitis lethargica, 11; continued fever, 1; dysentery, 9; ophthalmia neonatorum, 77. No case of cholera, plague, or typhus fever was notified during the week.

The number of cases in the Infectious Hospitals of the London County Council on August 9th–10th was as follows: scarlet fever, 1236; diphtheria, 1306; enteric fever, 12; measles, 623; whooping-cough, 455; puerperal fever, 24 (plus 5 babies); "other diseases," 112.

Deaths.—In 117 great towns, including London, there was no death from small-pox or enteric fever, 19 (1) from measles, 3 (0) from scarlet fever, 20 (3) from whooping-cough, 19 (6) from diphtheria, 40 (15) from diarrhœa and enteritis under two years, and 6 (2) from influenza. The figures in parentheses are those for London itself.

Of the deaths from measles 3 each were reported from Liverpool and Birmingham. Sheffield reported 3 deaths from whooping-cough, Hull, Liverpool, and Sunderland each 2. The number of deaths from diarrhœa has not risen; Liverpool reported 5, West Ham 3, and Salford 2.

The number of stillbirths notified during the week was 248 (corresponding to a rate of 40 per 1000 total births), including 38 in London.

PANEL AND CONTRACT PRACTICE

A Year's Administrative Experience

THE thirteenth annual report of the Ministry of Health, the general aspect of which was noticed recently in a leading article,[1] deals in particular with every phase of national health insurance from finance and administration of approved societies down to the dispensing errors of chemists. The variety of interest may be illustrated by the following points taken as examples of the range. In considering the persons liable or entitled to insurance it is stated that theatre attendants and stage hands are required to be insured only when employment involves more than 28 hours' weekly service or more than six hours weekly before 6 P.M.; 36 hours is still the standard of full-time employment for musicians in calculating their rate of remuneration. A lay Methodist pastor, employed by a circuit of that church, is employed under a contract of service, and therefore liable to contribute. A ship's barber, paying rent for his saloon, and recouping himself from his takings, is insurable as a member of the crew. A signwriter working on his own account for various business firms is insurable as a manual labour contractor.

Voluntary contributors continue to increase, being estimated at 400,000 at the end of 1931, as compared with 350,000 at the end of 1930. Certificates of exemption were held by 14,339 persons on March 31st last. Each year about 100,000 deposit contributors' accounts are opened, and 50,000 closed by transfer to approved society or lapse of insurance. Legal proceedings under the Acts were instituted in 1931 against 1230 persons, of which 1053 were for non-payment of contributions, 443 for detention of contract cards; 91 appeals have been decided by referees appointed by the Minister, of which 68 were about incapacity for work.

It was again decided (by Act of Parliament) that in the existing industrial situation the maintenance of insurance benefit rights of persons genuinely unemployed for a considerable period should be continued for another year.

REGIONAL MEDICAL SCHEME

The references for advice as to incapacity in 1931 numbered 591,943. Of these 588,510 were from approved societies, 2573 from insurance doctors, 860 from insurance committees; 39 per cent. related to men, 61 per cent. to women. The number of persons actually examined for incapacity was 290,436; 175,062 (29 per cent.) declared off before the date fixed for examination, and 124,103 (20·9 per cent.) failed to attend for other reasons. Of the persons examined, 63 per cent. were reported incapable, 37 per cent. not incapable. There were 1313 "consultation" references received: 1297 from societies, 13 from doctors, 3 from committees.

BENEFITS

There are 14,840 doctors on the panel. Medicine is supplied to insured persons at about 9500 chemists' shops. The number of insured persons entitled to benefit approaches 15,000,000. Medical benefit costs over £8,941,000, of which doctors receive £6,467,000, and chemists £1,987,500. The balance was expended in the adjustment of medical benefit to various special conditions arising under the Act. A sum of £203,000 was paid to insurance doctors for mileage, including places of difficult access, and £9000 was set aside to enable country doctors to attend courses of post-graduate study and towards other desirable facilities. £196,000 was paid to doctors for medicine supplied privately. £71,000 to approved institutions. £7500 to own arrangers.

Of additional benefits the dental is the most called on, £2,181,842 being allocated by societies in England; since its introduction in 1921 no less than £15,000,000 has been spent by approved societies apart from money contributed by insured persons as their proportion of cost. The central authoritative body in control of the benefit is working smoothly and advantageously to all concerned. Ophthalmic benefit comes next in popularity, and has £462,283 a year devoted to it. The average payment per case is under £1, and nearly half a million insured persons received benefit during the year. The department does not seek to influence a society's choice of its normal arrangement, but insists that a member must be free to go outside these arrangements if he so desires. The ophthalmic sub-committee of the consultative council had reported that it was in their view impracticable to devise a single form of ophthalmic benefit that could be recommended for adoption by all societies.

PRESCRIBING

Insurance chemists accept liability for supply of all drugs, and prescribed appliances ordered for insured persons by insurance doctors, and in return receive collectively the annual sum of the chemists' central pool. In 1931 it was found possible, after meeting cost of drugs and appliances in full, to pay dispensing fees at the rate of 118·67 per cent. for first three-quarters of calendar year, and at 116·80 per cent. for the last quarter. The number of prescriptions increased by 4½ per cent. over those for 1930—i.e., from 52,489,430 to 54,918,738—and the average number of prescriptions per insured person from 4·12 to 4·17.

	1930.	1931.
The average ingredient cost was ..	3·6*d.*	.... 3·488*d.*
Average total cost of drugs and appliances per insured person ..	2*s.* 8½*d.*	.... 2*s.* 9*d.*

In 1931 there has been less money withheld from doctors for excessive prescribing, and fewer cases sent to panel committees for investigation. Regional medical officers paid 1240 visits in 1931 to doctors whose prescribing appeared to call for explanation. The explanations were satisfactory in most cases.

STANDARD OF TREATMENT

There were 75 cases of breach of terms of service by insurance practitioners, and £837 7*s.* 9*d.* (not including over-prescribing cases) was withheld; 14 of these cases were of "negligence," 22 were certification rule cases, 12 cases were of failure to keep proper records, 9 of failure to furnish information to regional medical officers, 7 of failure to return medical cards. The largest sum of money withheld was £75, then £67 and £40 each in one case, and £30 in four cases.

There were 10 appeals to the Ministry against the decision of insurance committees: 5 by doctors, 3 by chemists, 2 by insured persons—in addition to 5 appeals (2, 2, 1) outstanding at the beginning of the year. Four appeals by doctors were dismissed and money was withheld from 3; 2 appeals were withdrawn, 1 was not decided at end of year. One appeal by a chemist was dismissed, money being withheld, 1 was withdrawn, 3 not decided.

[1] THE LANCET, July 23rd, p. 193.

Two appeals by insured persons were dismissed, 1 not proceeded with. An appeal by a doctor against a panel committee's decision to disallow claims for an anæsthetic fee was allowed.

Points from Committees

At BIRMINGHAM notices of deductions have been sent to practitioners in respect of drugs and appliances which do not appear to form part of medical benefit. One practitioner informed the insurance committee that he desired the prescribing of charcoal biscuits to be referred to the panel committee for discussion. Contemplated lectures by insurance practitioners on health have been postponed for another period of 12 months. The insurance committee lately received a postal order value 3*s*. 6*d*., issued at Bournville post office, without any reference or communication, and no application or inquiry has been received from the sender. The amount has been credited to the general purposes account. Can it be that some practitioner with a guilty conscience is returning a wrongly charged fee, or is some insured person endeavouring to recompense the panel practitioner for the 10 per cent. cut?

Investigations by Insurance Practitioners

THE Department of Health for Scotland has set up an advisory committee to make suggestions on the coöperation of general practitioners in medical investigations in Scotland. It has been felt that there are fields of medical investigation in which something has been lost in the past by the failure to appreciate the practitioner's point of view and to utilise his experience. The committee will begin by reviewing the statutory inquiries which are carried out by insurance practitioners as part of their contract.

CORRESPONDENCE

DEATH CERTIFICATION

To the Editor of THE LANCET

SIR,—The Registrar-General's statistical review is a brilliant compilation but, I venture to submit, misleading in certain particulars. The review serves a double purpose: it is the record of the causes of death during one year, and it enables comparisons to be drawn between that and other years. It is obvious that the value of the deductions drawn from the recorded deaths depends on the correctness of the deductions themselves as well as on the correctness of the data on which they are based.

In the revised version of his Manual of the International List of Causes of Death the Registrar-General sets out the form of death certificate introduced in 1927 and makes suggestions to medical practitioners about it. Where two or more causes of death are stated one of them must be selected for statistical purposes, and the selection made by rule, or the results would depend on the personal equation of the statistician. Briefly, the rule with certain minor exceptions is as follows:—

(*a*) If any form of violence be mentioned on the certificate that is the cause of death to select. (*b*) If no violence be mentioned, then the selection is determined by the relative position on the Registrar-General's list in which diseases are arranged in groups. A group 1 disease is to be selected in preference to a group 2 disease, and so on; of two diseases in the same group the one higher on the list. For example, small-pox being at the head of group 1, it is immaterial what other disease the patient had, for the death must be assigned to small-pox; the causes certified being diabetes and malaria, the death must be assigned to malaria, a group 2 disease, for diabetes is in group 3.

In the Manual the hope is expressed that the rules now in use may in the future be discontinued in favour of the expressed opinion of the certificator, but that time is not yet; when this is to take place it would seem necessary to include on the certificate the direct question: If confined for statistical purposes to one cause of death which would you select? The merit or demerit of the present arbitrary selection of the cause of death is, as regards disease, dependant on whether the diseases are arranged in the order of their fatality both as regards group and their position in their group. I hold that small-pox and malaria are wrongly placed, and that by the method of sampling, the appropriateness of the position of other diseases might also be tested.

For the year 1930 the deaths from small-pox are given as 28. In the latest revision of the Manual small-pox retains its pride of place at the head of the list, and this is strange for in his reports of both 1929 and 1930 the Registrar-General states that in 1923 the small-pox case-mortality rate dropped from 27·7 to 2·8 per 1000 and has remained low. Surely, under these conditions to select a disease with so low a rate in preference to all other diseases must be very inaccurate. Also the Registrar-General elects not to follow the international list which subdivides small-pox into major and minor varieties, although this subdivision is approved by the Committee of the International Health Office and by the Ministry of Health, for in the latter's Report No. 62 "On Small-pox Prevention" (published under the ægis of the C.M.O.), the terms variola major and minor are used throughout. Should not the Registrar-General subdivide small-pox and while leaving variola major at the head of group 1 relegate variola minor to some later group?

In a report published last year by the Ministry of Health (No. 62, p. 9) it is stated:—

"the actual deaths annually attributed to small-pox have ranged between 7 and 53 and even these have been attributed to small-pox rather by a rigid rule of classifying registered causes of death than in fact because small-pox was the operative cause of death. . . . A death certified to have been due to small-pox and pneumonia, for example, is classified to small-pox however slight the small-pox or severe the pneumonia."

The Registrar-General's method then in regard to small-pox produces returns not in accord with the facts. In Greater London, for example, there has been no extensive outbreak of variola major since the beginning of the century, although there have been of recent years several quickly quelled outbreaks, the cases in all not reaching a score. In England and Wales there have lately been 10,000 or more cases a year of variola minor; the persons in contact with this disease decline to take it seriously, often preferring to run the risk of it rather than be vaccinated. The Rolleston Committee recommended that everyone should be vaccinated in infancy, again at 7 years, and a third time later, in order to be immune. Imagine doing so for Greater London's 8,000,000 in the light of their very small variola major risk. If the Registrar-General did not conjoin the variolas, would not free vaccination, other than for contacts in time of epidemic, be abolished.

Again, the malaria deaths for 1930 are given as 40. Here again we have official support for supposing that this disease is too high up in the Registrar-General's list and the figure an over-estimate. In the second general report of the League of Nations

Malaria Commission (Geneva, 1927) it is stated (p. 50):—

"Our study included a detailed inquiry into 250 of the deaths registered as due to malaria in England and Wales during a few recent years. The inquiry into the 250 registered deaths in England showed that, even at the present day, there is a large error in the figures of mortality attributed to malaria."

It would seem probable that this error persists as the position of malaria on the list remains unchanged. These errors lead one to wonder how correct the figures are for other diseases, and if a sampling investigation of other diseases might not reveal plus and minus errors, in which event the diseases might either be more appropriately placed in the list or, remaining where they are, in addition to the figure for the disease, the error found and the year of the sampling might be stated in the yearly tables.

I am, Sir, yours faithfully,

R. W. JAMESON.

West Wickham, Kent, August 1st, 1932.

EPHEDRINE IN NARCOLEPSY

To the Editor of THE LANCET.

SIR,—There can be little doubt that the cases described and reviewed by Dr. Cohen in your issue of August 13th (p. 335) establish the value of ephedrine in the symptomatic treatment of narcolepsy. The results certainly give considerable support to the hypothesis of Doyle and Daniels that the cataplectic seizures are due to insufficient delivery of epinephrine during periods of emotional stress. If this is indeed so, the administration of sympathomimetic substances in this condition is not merely rational but at the same time exhibits a degree of specificity which for its own sake is worthy of further study.

May I report a few details of a case I investigated and treated in 1930, and which may throw some light on the mechanism underlying symptom-production in this disease.

The patient was a woman aged 25, and her history extended over most of her lifetime. Emotion and even comparatively mild degrees of exercise were constantly followed by sleeping attacks and typical cataplexy. The condition was extremely troublesome and appeared progressive and intractable. No focal lesion in the nervous system could be found. Slight flushing, perspiration, an extremely fine tremor, tachycardia and fall of systolic pressure were typical features of each attack. The family history was of great interest, in that the father was a severe diabetic and the patient the only survivor of a family of 11, all the other members of which had died *in convulsive attacks* in infancy. Although the syndrome warranted the appellation of narcolepsy which it had previously been given, consideration of the clinical picture suggested the more illuminating description of paroxysmal hypoglycæmia, presumably due to a fault in the maintenance of the blood-sugar level during emotion and exercise at or above the individual level necessary for consciousness and normal activity.

The underlying mechanism in such a case might readily be a delay in the supply of pressor and sugar-releasing amines. The case in question had undoubtedly some extremely labile system of this sort, the resulting imbalance expressing itself in the frequency of the attacks. While an adequate biochemical examination was not carried out to determine the quantitative variations in the blood-sugar and their relation to attacks in this individual, the remarkable result following treatment may be considered as diagnostic of some such error as I have suggested. Immediate and practically complete amelioration followed when the carbohydrate intake was augmented to a considerable degree by, among other steps, the administration of orange juice and glucose throughout the day. Any psychic effect may be discounted in view of the long history of lack of response to various therapeutic agents. I may add that there was no evidence of hyperinsulinism or of the existence of a primary pancreatic lesion such as β-cell adenoma; the fault apparently lay exclusively in a delayed adrenaline response.

I suggest that in at least some of these cases of idiopathic narcolepsy the symptoms are due to a falling blood-sugar, and that such substances as adrenaline and ephedrine owe their curative action in this condition to a release of sugar from the liver.

I am, Sir, yours faithfully,

ALEXANDER HADDOW.

University New Buildings, Edinburgh, August 15th, 1932.

CARBOHYDRATE CONTENT OF FOODS

To the Editor of THE LANCET

SIR,—May I point out that the figures given by McCance and Lawrence for foods rich in carbohydrate agree closely with those obtained by most previous observers, and that their range of percentages of reducing sugar for most fruits and vegetables also corresponds fairly well; it is almost entirely in their values for green vegetables, which are rich in pentoses, pentosans, &c., that a noteworthy difference occurs, and this is due to the fact that they have subtracted from the reducing sugar a figure stated to represent the "non-fermentable sugar." Although there can be no doubt that some of the published values for such foods have been too high, especially when they have been obtained by "difference," it seems to me that McCance and Lawrence have gone to the opposite extreme, for the occurrence of alimentary pentosuria, under suitable conditions, in a few people, suggests that normally the pentoses of fruit and vegetables are metabolised and cannot therefore be justifiably excluded from the analysis; moreover, the methods of estimating these substances are not altogether reliable. It is not a matter of great practical importance, however, since most diabetic patients prefer to take the bulk of their carbohydrate in the form of high-value foods, such as bread, potato, apple, &c., and low-value vegetables furnish a comparatively insignificant proportion of the total intake; consequently the difference between the results worked out by the older tables and from the figures given by McCance and Lawrence does not generally amount to more than a few grammes a day. Further, it has to be borne in mind that the carbohydrate content of a food as determined by chemical analysis is not necessarily an exact index of the amount absorbed, since there appear to be considerable variations in the capacity of different people to metabolise the food they eat. The only really reliable method is to test out each important carbohydrate food for the individual patient, as I have been insisting for many years.

For the reasons I have stated, and also on account of the natural and seasonal variations in the carbohydrate content of fruits and vegetables, average figures, such as the "available carbohydrate" quoted by McCance and Lawrence, rarely represent the proportion actually available. In apples, for example, they state that the total reducing sugar varies from 7·4 to 12·1 per cent., with a mean of 8·9 per cent., allowing a "non-fermentable sugar" of 1·2 per cent., we have an "available carbohydrate" of 6·2 to 10·9 per cent., with a mean of 7·7 per cent.; a 5-gramme portion on the last-named would, consequently, work out at 2¼ oz., but, owing to the variation in the available sugar, this weight might actually contain

anything from 4 to 7 grammes of carbohydrate. Similarly, since the mean "available carbohydrate" in raspberries is stated to be 2·7 per cent., a 5-gramme portion would weigh 5½ oz., but it might equally well contain anything from 3 to 9 grammes, since the "available carbohydrate" ranges between 1·7 and 4·8 per cent. If, therefore, a 5-gramme portion of apple is substituted for a 5-gramme portion of raspberries it may possibly contain the same amount of carbohydrate, but very probably it will not, and may represent double the quantity on the one hand, or less than half as much on the other.

I am, Sir, yours faithfully,

P. J. CAMMIDGE.

Nottingham-place, W., August 15th, 1932.

THE MECHANISM OF TUMOUR FORMATION

To the Editor of THE LANCET

SIR,—A letter from Prof. G. W. Nicholson in THE LANCET of Feb. 13th (p. 368) ends with the remark:

"Surely, the proper question for pathology to try to answer is not 'what is the cause of cancer?' but 'what is the biological mechanism of tumour formation?'"

It is obvious that Prof. Nicholson considers tumour formation to be a biological phenomenon, and as I share his belief I shall here endeavour, as a pathologist, to answer his question.

In Egypt we see many bilharzial irritation cancers especially in the urinary bladder. This is a natural experiment of cancer production by irritation in man; and the innumerable phases and stages of this type of cancer formation coincide in many respects with the phenomena observed in experimental cancer formation. Especially important is the fact that, while the bladder presents many bilharzial lesions, the cancerous process starts in one only. Not only this, but in my observations I have never seen a bladder with a bilharzial cancer showing any elevated bilharzial papillomatous formation; it is as if the active cancerous growth inhibits the formation of the irritation benign papillomata.

Workers on cancer have done a good deal of trying to put their eye in a microscopic field on the cause of cancer, which I believe with many others does not exist as an entity. Excessive division of the spermatogonia in the testicle tubules at the age of puberty results in a physiological cell mutation which takes the form of maturated haploid germ cells. A somewhat similar process in the germ cells of the ovary finally results in the physiologically mutated haploid maturated ovum. The haploid maturated germ cells are known in nature to get loosened from their sites of origin and to migrate actively or passively. If two such cells of opposite sexes meet in a suitable soil they join to form one cell capable of excessive division or reproduction. At a site of chronic irritation in an epithelial tissue, long standing and excessive division occurs in the germinal epithelial layer. This, in time, has been known to bring about irregular and abnormal mitosis, resulting in mutated germinal epithelial cells with abnormal numbers of chromosomes, some with lower and some with higher numbers than that normal for the somatic cells of the species.

During this chaos of mitosis there is a chance for haploid cells to form in the actively and abnormally dividing germinal epithelial layer which is always immediately next to the supporting connective tissue. Such haploid cells, by virtue of their natural activity, and being marginal in position, may migrate to the subjacent connective tissue spaces. If, by chance, two such haploid cells encounter and approach each other, they join or conjugate or even fertilise each other as we choose to call the act in our artificial expressions not known to nature nor to its elements. The result will be an epithelial cell newly formed by the union of two epithelial haploid cells in the subjacent connective tissue spaces. Such a cell, by virtue of its mode of formation, has a great capacity for excessive division and reproduction; and by virtue of its situation, being now dislocated by its natural locus, is not under the control of the natural environments. This cell is therefore biologically independent of the body, but parasitically dependent on it for support and nutrition and drainage of metabolic products. The cellular mass resulting from the reproduction of this cell will conform with every phenomenon of malignant new growths occurring naturally or experimentally.

The above-mentioned biological mechanism is compatible with the "somatic cell mutation theory of cancer" provided we observe that, when we speak of chromosomes, we are speaking in terms of exact numbers in relation to the number normal to the species. This is because nature has given special capacities to two types of cell with regard to the chromosome numbers of the nuclei, one with the complete number of chromosomes, and the other with exactly half that number; and there is no need to assume another special capacity for a new type of cell, say with three-quarters of the number of chromosomes characteristic of the species. Cancer cells will, therefore, have the normal number of chromosomes characteristic of the species, and the marginal cells seen with abnormal numbers result from quick and repeated cell divisions under no control—that is to say, in all circumstances known to invite abnormal mitosis.

I am, Sir, yours faithfully,

M. F. SOROUR, M.D. Cairo,
Assistant Professor of Pathology.

Medical Faculty, Cairo, Egypt.

THE INCREASE IN ARSENIC-RESISTANT SYPHILIS

To the Editor of THE LANCET

SIR,—An article,[1] entitled "A New Phase in Early Syphilis," by Dr. J. A. Drake and Dr. M. Sydney Thomson, demands, in my opinion, careful consideration. These observers record a "strikingly rapid progression" in the incidence of "arsenic-resistant" cases of syphilis attending the department of syphilis at King's College Hospital. In spite of the fact that the majority of the patients were in good health and were submitted to the course of treatment which long experience had proved satisfactory, the usual therapeutic results did not follow, and it is noteworthy that early gummata developed. The authors found no relation between the strength of the Wassermann reaction and the severity of the symptoms. They also note that a large number of other cases followed the normal course in reacting to the drug.

The profession should be grateful to Dr. Drake and Dr. Thomson for bringing forward evidence that a more resistant form of spironema is making its appearance. Some of us have suspected this for some years, and this suspicion has been supported by the progressive increases in the total dosage of arsenic recommended in V.D. clinics and the advocacy of bismuth, mercury, &c., as necessary adjuvants by most authorities. In 1911, Prof. J. McIntosh and

[1] Brit. Jour. Derm. Syph., June, 1932, p. 297.

Dr. P. Fildes, in their classic work "Syphilis from the Modern Standpoint" (Arnold, pp. 221–23), pointed out the risk of producing "strains of spirochætes 'fast' to 606." They described two cases, and concluded that "if such strains become general the therapeutic value of the substance will be much diminished." Is it unreasonable to suggest that the increasing employment of arsenicals is the chief factor in causing the progressive increase in arsenic-resistant cases? Every clinician of long experience will remember that before the introduction of "606" there had been a diminution in the severity of syphilis, and particularly in gummata.

Once more, I venture to point out the need for an independent authority to appraise the value of present-day antisyphilitic therapy.

I am, Sir, yours faithfully,

JAMES H. SEQUEIRA,
M.D., F.R.C.P. Lond., F.R.C.S. Eng.

Makuyu, Kenya, July 12th, 1932.

OBITUARY

SIEGMUND MORITZ, M.D. Würzburg, M.R.C.P. Lond., M.Sc. Manch.

Dr. Moritz, who died on August 9th in his seventy-ninth year, at the house in Rusholme, Manchester, where he had lived for 40 years, was born in Berlin, educated there, and at Leipzig and Würzburg. Having taken his doctorate at the last-named university, he studied at University College, London, taking the L.R.C.P. in 1878 and becoming a naturalised British subject in the same year. He then became resident medical officer to the Royal Infirmary at Manchester, a post which he held for ten years, during which he was associated in pathological research with the late Prof. J. Dreschfeld. On leaving the infirmary he became medical officer to the Manchester Hospital for Consumption, on the active staff of which he remained until 1923, assisting at and being largely instrumental in the development and enlargement of this hospital and its extension in the Delamere Sanatorium. In 1904 Dr. Moritz was appointed lecturer on diseases of the throat and nose in Manchester University; he was a frequent contributor to medical journals on such subjects as ozena, adenoids, diseases of the accessory cavities, and the laryngeal symptoms of general disease. He was always interested in physical signs and their significance, his earlier publications dealing with the interpretation of breath sounds and the diagnosis of cavities in the lung. Dr. Moritz became a Member of the College of Physicians of London in 1881, was made an honorary M.Sc. by Manchester University in 1908, and continued until recently to enjoy a large consulting practice in Manchester and neighbourhood.

THE LATE SIR CHARLES BURTCHAELL

AN officer who served under him writes: "Sir Charles Burtchaell was a man of outstanding personality, as big in mind and heart as he was in physique. A born organiser, a critical taskmaster, he did not suffer fools gladly or show any toleration for such as were lacking in a sense of duty; he could, however, claim the admiration and affection of an enormous number of officers of every branch of the army. It was an education to serve with him, to see the hand of friendship extended to so many when in difficulties, to see the sympathy and kindness with which he abounded, and to see the way in which he tackled the big problems of life, always endeavouring to visualise what the results of his decision would be, not to-day or to-morrow, but in the days or years to come. He was a wonderful organiser, and to this was due the successful mobilisation of the medical services in 1914, the result of his work at the War Office during the years immediately preceding the war, and few realised how big a part he played throughout the war in the administration of the medical services in France, which earned the praise of the whole of the world. He was entirely responsible for the creation of a vast scheme for the saving of man-power. By the construction of huge convalescent camps in France and by further expansion of the large hospitals there, he was able to retain in that country the majority of the sick and lightly wounded, and thereby ensured their early return to the fighting line and the saving of many thousands of troops to the army in France.

"His intimate knowledge of the army, coupled with his judgment and foresight, were of inestimable value when giving evidence before various Commissions dealing with the military medical services both during and immediately after the war; this was particularly so in the case of the Inchcape Commission in India, before which he had to defend the interests of the military medical services of that country, and on conclusion of which he earned the highest praise from Lord Inchcape for the way in which he had presented his case. His energy was inexhaustible, his work was never controlled by any 'eight-hour day,' nor did his office hours conform to any rigid War Office rule. When Assistant Director-General at the War Office during the years immediately preceding the war, he made it his special duty to know every officer in the R.A.M.C., and he possessed a wonderful knowledge of the abilities and characteristics of the majority of the officers of the corps. Possessed of a great sense of humour, a most happy disposition, and a host of friends, he was a delightful companion and could in all truth say he had lived every day of his life. Full of knowledge of the army, its history and traditions, imbued with a deep affection for his corps, he was always endeavouring to foster esprit de corps amongst others, and to benefit both his brother officers and the corps in which he had spent his life, and in which he had endeared himself to so many."

THE LATE CAPT. W. J. A. COLDSTREAM, I.M.S.

A BRIEF notice has been given [1] of Captain Anson Coldstream, who was murdered on July 22nd at Peshawar. Prof. W. T. Ritchie writes: "Coldstream had always intended to be a soldier, but, when he left school at the time of the Armistice, the main work of the army appeared to him to have been accomplished, and he decided to enter the medical profession and became an undergraduate at Edinburgh University. He had a brilliant university career, winning the Thompson Medical Bursary, which later he resigned for a Dunlop Research Scholarship. In his final examinations he was placed first, both on the surgical and medical side, with the Ettles Scholarship and Leslie gold medal.

"It was, to some of us, a disappointment that he abandoned his chance of a distinguished career at home when he accepted a commission in the Indian

[1] THE LANCET, July 30th, p. 259.

Medical Service, a choice which may have been influenced by an hereditary call to India. His father and both grandfathers had served there; his father in the Royal Engineers, and his grandfathers, William Coldstream and Sir John Foster Stevens, in the Civil Service. He spent some years of work in military hospitals with six happy months in the Chitral mountains as doctor with a survey party. In 1930 he took study leave home and obtained his F.R.C.S. Edin. On returning to India, he was posted to the political department and joined the Southern Waziristan Scouts at Jandola, where he found the frontier life and duties very congenial. In recognition of his hard and, sometimes, dangerous work in Waziristan, he was selected in December for the appointment of civil surgeon of Peshawar, the heaviest medical post in the Frontier Province. It was at Peshawar that he saved the life of an Indian patient by giving an unusually large transfusion of his own blood. He met his death when on duty in hospital, on his way from office to operating room.

"The tragedy was not the first of its sort in Capt. Coldstream's family. In 1897 his mother's brother, Lieut. J. Stevens, of the 20th Punjab Infantry, was killed, also at Peshawar, by a Pathan fanatic."

THE SERVICES

THE LEISHMAN PRIZE

Major D. T. Richardson, M.C., R.A.M.C., has been awarded the Leishman prize (officers) for 1931, consisting of a silver medal and a sum of £30, for his work in the interests of military hygiene. The prize is awarded annually for the best piece of work in any branch of medicine, surgery, or allied science, or in connexion with the general duties of the Royal Army Medical Corps, by an officer of the Royal Army Medical Corps, or Army Dental Corps, or by an officer removed from either of these corps, but still on the active list.

NORTH PERSIAN FORCES MEMORIAL MEDAL

Dr. Neil McLean, Colonial Medical Service, has been awarded the North Persian Forces memorial medal for the year 1931 for his paper on a Sleeping Sickness Investigation in the Infected Areas of Kavirondo (1930–1931), published in the *Kenya and East African Medical Journal* (1931, viii., 180). The medal is awarded annually for the best paper on tropical medicine or hygiene published in any journal during the preceding 12 months by a medical officer, of under 12 years' service, of the Royal Navy, Royal Army Medical Corps, Royal Air Force, Indian Medical Service, or of the Colonial Medical Service.

ROYAL NAVAL MEDICAL SERVICE

Surg. Lts. W. Greaves and A. M. Lawrence-Smith are transferred to the Permanent List.

S. J. Wheeler to be Surg. Lt.

The following appointments are notified: Surg. Lt.-Comdr. J. J. Cusack to *Victory*; and Surg. Lts. E. J. Mockler to *Resolution* and J. G. Currie to *Tamar* for Singapore Base.

ROYAL NAVAL VOLUNTEER RESERVE

Proby. Surg. Sub-Lt. P. M. Coats to be Surg. Sub-Lt.

Surg. Sub-Lt. H. E. Halling to be Surg. Lt.

ROYAL ARMY MEDICAL CORPS

Maj. J. Hare, Reg. Army Res. of Off., is re-empld. under the provisions of Art. 520 (b), Royal Warrant for Pay and Promotion.

Capt. R. J. Rosie from the secd. list, is restd. to the Estabt.

ARMY RESERVE OF OFFICERS

Lt. F. R. Curtis to be Capt.

TERRITORIAL ARMY

Maj. T. S. Goodwin retires and retains his rank, with permission to wear the prescribed uniform.

R. E. M. Fawcett (late Offr. Cadet, Univ. of Lond. Contgt., Sen. Div., O.T.C.) to be Lt.

Supernumerary for Service with O.T.C.—Lt. G. L. Montgomery to be Capt. supern. for serv. with Med. Unit, Glasgow Univ. Contgt., Sen. Div., O.T.C.

INDIAN MEDICAL SERVICE

Col. T. G. F. Paterson to be Maj.-Gen.

Lt.-Cols. W. D. Ritchie and A. K. Lauddie retire.

MEDICAL NEWS

University of Oxford

On July 30th the following degrees were conferred:—

B.M.—Frank Hawking, H. G. H. Waters, G. B. Malone-Lee, J. L. Ryce, W. H. Greany, A. J. E. Edelsten, R. H. Bolton, R. L. H. Townsend, and (Mrs.) C. E. Nicholson.

At recent examinations the following candidates were successful:—

DIPLOMA IN OPHTHALMOLOGY

R. A. Condon, H. D. Dastoor, Innis M. Macdonald, V. B. Purvis, and Kalidas Saha.

The Astley Cooper Studentship

The holder of the Astley Cooper studentship, tenable at Guy's Hospital Medical School, acts as assistant to the curator of the Gordon Museum. The appointment is for a year, after which there may be re-election for a further three years. Particulars will be found in our advertisement columns.

Irish Hospitals

The formal opening took place last week of Dunmanway Cottage Hospital, County Cork. The hospital, which has 24 beds, with a maternity ward, provides for an area with a population of 10,000. It has been built entirely of Irish materials at a cost of £3000.—On the same day were also opened extensions and improvements to Hopefield Cottage Hospital, Portrush, County Antrim. The additions, which have cost £4000, to which both the Government of Northern Ireland and the county council contributed, include a pathological laboratory, a new X ray room, and a sun parlour. The county council has decided to send many of its cases of surgical tuberculosis to the hospital, which commands a fine view of the northern seaboard.

Sussex Provident Scheme

Nearly £10,000 was paid to hospitals for services rendered to subscribers to this scheme during the first six months of this year. This sum was £1219 more than for the corresponding period of last year. The money was distributed as follows: Royal Sussex County Hospital, £3506; the New Sussex Hospital for Women and Children, £980; the Royal Alexandra Hospital for Sick Children, £968; Brighton corporation, £562; Hove Hospital, £526; Haywards Heath Hospital, £493; Sussex Maternity and Women's Hospital, £319; Sussex Eye Hospital, £299; Worthing Hospital, £298; Uckfield Cottage Hospital, £244; and Brighton and Hove Provident Dental Hospital, £217.

Royal Medical Benevolent Fund

At the last meeting of the committee 57 grants were voted, amounting to £1116. It was reported that subscriptions and donations received during July, 1932, were considerably less than those received in July, 1931. The following are particulars of a few cases helped:—

M.B., aged 68. Only able to do very light work owing to ill health. His relations give what help they can, but his total income is only £68 per annum. One supporter of the case wrote "the circumstances are deplorable." Fund voted £40 in four instalments for twelve months.

L.F.P.S., aged 79. This applicant has been an invalid for four years with very severe cardiac trouble and has not been able to work. He is entirely dependent on his niece, aged 42, who is trying to make a living by taking in paying guests. Fund voted £40 in four instalments for twelve months.

Daughter, aged 62, of M.R.C.S., is suffering from mitral disease which renders her unfit for her work of nursing. The applicant has for some years been helped by an allowance of £6 a month from her married sister, but owing to business failure this help has now ceased. Fund voted £26 in four instalments for twelve months.

Widow, aged 50, of M.R.C.S. who died June, 1932, at the age of 46, leaving widow with four boys, ages 19, 16, 14, and 9. It is expected that the estate will yield a capital of £1300. Fund voted £26 in four instalments and a special gift of £12.

Cheques should be forwarded to the honorary treasurer of the fund, 11, Chandos-street, London, W.1.

Medical Diary

Information to be included in this column should reach us in proper form on Tuesday, and cannot appear if it reaches us later than the first post on Wednesday morning.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, London, W.

MONDAY, August 22nd, to SATURDAY, August 27th.—ALL SAINTS HOSPITAL, Austral-street, West-square, S.E. Third week of post-graduate course in Urology. Afternoons, Clinical and Cystoscopic demonstrations. Individual clinics available daily, by special arrangement with the Fellowship of Medicine. (Open only to Members of the Fellowship of Medicine.)

NOTES, COMMENTS, AND ABSTRACTS

A PREFACE TO MODERN SCIENCE

MEDICAL men who take their children to the Science Museum at South Kensington will notice that, very rightly and properly, a prominent place has been given to medicine in the children's gallery that was recently opened. The gallery is in the basement of the building, and deals with some of the fundamental advances owed to science. So far as medicine is concerned alchemy, as a stage in the advancement of science, has not been forgotten, and a transparency shows the alchemist and his assistants at work with their alembics, their quaintly shaped phials, and the furnace suggestive of Weyland Smith. Medicine's Eastern associations, too, are suggested by a seventeenth-century Turkish bazaar, while a seventeenth-century drug shop from Granada recalls the debt that Europe owes perhaps even more in medicine than in the other arts to Arab influence. In contrast is a transparency of the shop of a modern pharmaceutical chemist, illustrating the close coöperation now existing between the pharmacist and the chemist in the more general sense of the term. By these exhibits science has gracefully acknowledged its debt to medicine. Wise parents will see to it that the children's gallery is used as is intended. Its purpose will be served if it gives the child a bird's-eye view of certain grand aspects of progress. For instance, by carefully graded steps in one section there is recapitulated the history of illumination: the firebrand in the cave age; the Roman lamp as it lighted the soldier on Hadrian's wall; the tallow dip lighting the cell in which Prince Arthur waited his fate with his gaoler Hubert; a drawing-room in the early years of Queen Victoria, when the colza oil lamp, with its clockwork mechanism for pumping up the oil, was a great advance; gas lighting with the old fish-tail and rat-tail burners that were a great step forward, right on to the incandescent mantle of 1885; and, finally, up to electricity with the arc, the filament, and, lastly, concealed and flood lighting. Another recapitulation deals with transport. Cro-Magnon man is seen astride of a log in the stream while a comrade is carrying the carcass of a pony on his shoulders. There is the later Neolithic period with the sledge and pack animals side by side with modern yak transport, just to convey a hint of the extent to which we are dependant on the road. We are shown a monstrous idol being moved by rollers with a man standing on its knees clapping his hands to see that the men yoked to it haul in time; and so one passes by the stage coach and the early steam carriage, with the velocipede thrown in, to the gigs and hansoms of a vanished London. Problems of irrigation are illustrated, and the curious old instrument is included by which water was screwed up from a lower level into troughs. There are water wheels and windmills, and a Watt steam beam engine working harnessed to a tilt hammer. Pottery is traced in its various stages, and by the turning of a wheel friction warms the bulb of a thermometer, driving the mercury up the scale. Aviation comes very thoroughly into its own, its history being sketched from Dædalus, through the Wrights and Blériot, right up to the *Argosy* with 20 passengers on board and a cruising speed of 100 miles an hour, while in a wind tunnel there is a captive aeroplane that rises vertically as a fan drives a blast of air against it. There is a whole series of models illustrating the development of the sailing craft. One life-size model shows how flints are still being chipped for use in firearms in various parts of Asia and Africa, while another demonstrates how nails were made by hand. Unlike the great collection, sufficiently small and compact to be taken as a whole, the new gallery definitely adds to the amenities available to children in London. It should prove valuable both in itself and as an introduction (as is deliberately intended) to the larger collection, where a study of the exhibits will naturally lead. The present basement location of the exhibition is unworthy, but perhaps cannot be altered. Considerable extension of it is, however, planned for opening in the near future.

MENSTRUATION DURING LACTATION

IT is a common belief that if menstruation recommences during lactation the infant should be weaned for fear of digestive upset due to some poisonous substance secreted in the milk at the periods. Dr. E. Eltz,[1] of Frankfort-on-Maine, has made painstaking inquiry into this theory and has used a method devised by Macht and Lubin where the effect of human milk is tested upon the growth of lupin seedlings.

The seeds are grown for three days and the length of their roots is accurately measured. They are then transplanted to the top of small test-tubes which contain the various solutions to be tested. A control medium consisted half of distilled water and half of a solution of calcium nitrate, magnesium sulphate, and a phosphate. In the test solutions 1 per cent. of human milk was added and only 49 per cent. of distilled water. Milk was obtained from 11 subjects in six of whom menstruation began shortly after the birth of the child. The roots of the lupin seedlings, kept at 20° C., were measured after 24 hours, and the growth of the seedlings in the test solution was expressed as a percentage of the growth of the controls.

By this method it was found that there was a definite inhibition of growth with milk obtained on the day before menstruation, after which there was a slow rise in growth until normal was reached again about the fourth day of the period. This was a very constant finding, even when the periods were irregular. Two further points of interest were also determined. Immediately between two periods, at the time when ovulation is thought to take place, a drop in the growth curve was noticed, suggesting that the inhibiting substance was secreted in the milk at this time. Further, in those women whose menstruation did not reappear during lactation there was a regular drop in the growth of the lupin seedlings with samples of milk obtained at times corresponding to the expected dates of menstruation.

Eltz discusses many points arising out of these experiments. He shows that many pædiatricians have described symptoms in infants, fed during menstruation, suggestive of some slight toxic action. These include restlessness, colic, frequent motions, and sometimes even urticaria. This last symptom seemed to suggest that the toxic substance, whatever it might be, was actually absorbed through the wall of the bowel. To test this point he carried out a further series of tests on guinea-pigs. To these animals human milk was given and their blood was tested for an inhibitory action on the lupin seedlings as before. During menstruation human milk produced through the blood of the guinea-pigs a definite decrease in growth; in one case this dropped to 60 per cent. of the controls with the milk obtained on the day before a period began. The effect of ovulation, it is stated, could also be detected via the guinea-pig.

Eltz gives an interesting summary of authoritative views on the nature of this "menotoxin," the word used by Schick to describe the substance in the blood of women during menstruation, which may be

[1] Jahrb. f. Kinderh., 1932, cxxxvi., 82.

excreted in the milk. He comes to the conclusion that menotoxin is closely related to, if not identical with, choline. His work raises many questions of theoretical interest, but it is important to note that the disturbances of infants fed during menstruation are usually slight, and most authorities are emphatic that the occurrence of menstruation during lactation is not an adequate reason for interrupting breast-feeding nor for weaning—a view which is strengthened by Eltz's finding that the growth-inhibiting factor was present in the milk at monthly intervals in the absence of obvious menstruation.

LENGTH OF DAYS

BEFORE the Section of Comparative Anatomy of the British Medical Association, Mr. G. P. Bidder, Sc.D., said that men, horses, and dogs with the onset of age show symptoms which are grouped for convenience under the term senescence, these symptoms not being displayed by water voles, female plaice, sea anemones, and the bath-sponge. A report of these words has brought the following couplets from one whose initials mask an identity that is to a considerable extent defying the manifestations of senescence.

SENESCENCE

The merry mayfly sports her hour,
The tearful tumblebug his minute;
If there be praise for length of days,
No butterfly need hope to win it.
Though parrot, many-wintered crow
And swan retain their adolescence,
No little dickey-bird may know
The pensive pleasures of senescence.

Nor may the nobler brutes exult,
Nor man sweet senile visions foster;
Arthritis grips us when adult,
The coster's moke survives the coster
The elephant and jocund whale,
Mammalia of stateliest presence,
At thirty lustres kick the pail
With all the gestures of senescence.

Toads stay the course in better style;
The tortoise knows the trick of living.
The crocodile on banks of Nile,
Weeps out two centuries of grieving;
When, having dried her fount of tears,
She yields the palm for deliquescence,
Sequoia's fifteen hundred years
Betray no symptom of senescence.

Since giant forests fall at last,
An anti-climax we'll consider.
Some organisms defy their past;
Hark to the lore of Dr. Bidder—
"The water-vole, the female plaice"
Preserve youth's undefeated essence,
While, changeless through un-numbered days,
"The bath-sponge *never* shews senescence.

H.M.W.

AN EARLY ACTION FOR PROFESSIONAL DEFAULT

STUDENTS of the early history of medical practice will find a curious case, dating from the year 1408, among the varied contents of the recently published "Calendar of Select Pleas and Memoranda of the City of London." It is an action apparently to recover certain precious stones called serpentines. The parties, John Clotes of Bemelond and John Luter, "leche," a Fleming, appear before the mayor and recorder. Clotes complains that six weeks ago he delivered to Luter 15 serpentines worth 9 marks, a tablet of gold worth 60*s*., and a sword worth 6*s*. 8*d*., which Luter was to retain if he cured him of "lepre." Clotes complains that he has not been cured and he puts his damage at £20. Luter replies that it is true that Clotes came to him, but Clotes asked to be cured of a disease in the face, called *salsefleume*. This word, according to Mr. A. H. Thomas, the learned editor of the calendar, is a form of the mediæval Latin *salsum phlegma* and means a facial swelling or inflammation supposed to be due to salt humour, this last word reminding us of the ancient and mediæval classification of the four bodily "humours" of which phlegm was one. Luter states that he agreed to cure Clotes provided that the latter was not leprous; Clotes, he says, assured him he was not. At this point the mayor intervenes with a shrewd question: does Luter say that Clotes was leprous or not leprous at the time when the goods were delivered? Luter replies that he well knew Clotes was leprous and he told him so, though Clotes was willing to swear he was not. Thereupon, the mayor tells Luter that he has taken the plaintiff's goods fraudently, deceitfully, and wrongfully. Luter rejoins that, if he did not exactly cure Clotes of leprosy, at any rate he taught him how to make balsam and other medicines and so he thought himself entitled to keep the goods. The case apparently finds its way into Chancery—we are not told with what result.

The word "leche," by which Luter is described, is of respectable antiquity. Bede used it, several centuries earlier, of Cyneferth, who operated upon Queen Etheldreda for a tumour. The volume of Select Pleas, from which we have been quoting, twice mentions "physicians." One "fusycyan," Laurence Markeys, is rich enough to be robbed of £40 worth of goods. Another, called "fisicus" and described as a physician to the queen, wants a goldsmith to hand over a silver cup for which he has paid five nobles. The goldsmith says he has received only three nobles; apparently his version is accepted. What is the difference between a leech and a physician at this period? "I am a leche and with al a good phesycyen" says a character in Caxton's Fables of Æsop a hundred years later. Wherein lies the distinction?

A TEST OF THYMOPHYSIN

THYMOPHYSIN was introduced in 1926 by N. Temesváry, of Budapest, who had found that extract of thymus gland increased the contractions of the isolated uterus, the contractions being more rhythmical and longer sustained than those induced by pituitary extract. Temesváry combined the thymus with posterior pituitary extract, for he believed their actions were complementary, thymus reducing the violence of the contractions caused by pituitary but rendering them more prolonged and more rhythmical, whilst other observers claimed that it also prevented the onset of uterine exhaustion. Since that time the drug has been extensively used in the United States and on the continent of Europe, and numerous papers about it have appeared. It seems, however, to have been very little employed in this country, probably because British obstetricians were not disposed to believe that the addition of extract of thymus gland—a gland that normally atrophies at puberty—could have any important physiological action on the adult uterus, or modify to any clinically appreciable extent the action of pituitary extract.

Mr. Frederick Roques and Mr. Douglas H. MacLeod[1] have now, however, described the results of its use in 100 primiparous labours at the Middlesex Hospital. The cases were almost consecutive, only patients with malpresentations, disproportions, non-engagement of the head, high blood pressure, or some complication such as cardiac disease being excluded. The results were compared with those obtained in the preceding 100 successive cases of primiparous labour in which thymophysin was not used. It was found that powerful uterine action began about 5 minutes after injection and continued for 30 to 40 minutes, the action being in no respect different from that of pituitrin. Whether given early or late there was no evidence that thymophysin shortened the labour or any of its stages. There was no change in the forceps incidence or in the stillbirth-rate, and no increase in the number of perineal lacerations. No attempt was made to test the value of thymophysin in induction of labour, but a few observations were made on the effect on blood pressure, and it was concluded that, generally speaking, this was slightly raised. Roques and MacLeod confirm the experimental findings of E. E. Nelson—who examined four cases with a hydrostatic bag inside the uterus—and conclude that the action of thymophysin is entirely due to its pituitrin content. They believe

[1] Jour. Obst. and Gyn. Brit. Emp., 1932, xxxix., 320.

that it has no advantage over pituitrin, and that its use cannot be recommended except in the circumstances, and with the precautions, that we are accustomed to regard as indispensable for the safe use of that drug.

FACTORY GIRLS' HOLIDAYS

IN a letter received from the Factory Girls' Country Holiday Fund we are reminded that the fund exists to provide at least a week's holiday in the country for the poorest girls and women employed for long hours in the hard, monotonous work of London factories. . . . "In 1930 £1542 enabled the fund to provide board and lodging for 1030 girls and women for 1250 weeks. It is clear that the need this year is more urgent than ever. In consequence of the widespread unemployment of fathers and brothers, with 'short time' and 'time off' themselves, the girls are bearing their full share of the financial burdens which most people have to shoulder at the present time. They cannot make the contribution which otherwise they are so ready to make. Unless more money comes in the fund may have to stop sending the girls away. We appeal to those who even in bad times can manage to get a holiday, and ask them to help these patient, cheerful workers to get what does them so much good. Subscriptions and donations may be sent to Mrs. Slater, hon. treasurer, or to Miss Canney, 75, Lamb's Conduit-street, W.C. 1."

The appeal is signed by the Bishop of London, the Countess of Sandwich, Bishop Paget, Miss Lilian Braithwaite, Sir Thomas Barlow, and Lady Loch.

Mr. MACLEOD YEARSLEY writes: "Some irresponsible person has put it about that I am retiring. May I ask the courtesy of your columns to deny it absolutely? The rumour is entirely false."

Appointments

London County Council.—Assistant Medical Officers, Grade I.: EDWARDS, K. ST. V., M.B., Queen Mary's Hospital for Children (transferred from Grove Hospital); HOBDAY, F. T. G., M.R.C.S., Hammersmith Hospital; SCOTT, T. S., M.B., St. George-in-the-East Hospital; ALLINSON, F. W., M.B., Queen Mary's Hospital for Children. Assistant Medical Officers, Grade II.: KNIGHT, B. W., M.B., St. George-in-the-East Hospital; NEWLANDS, H. J., M.B., Paddington Hospital. Clinical Assistants: GAYER, Miss L. B., M.R.C.S., Fulham Hospital; FRY, W. B., M.B., St. Stephen's Hospital.

Vacancies

For further information refer to the advertisement columns

Birkenhead General Hospital.—Cas. O. At rate of £100.
Birmingham, Queen's Hospital.—Res. Med. Reg. £200.
Birmingham, Selly Oak Hospital.—Surgeon. £700. Also Cas. O. £200.
Blackburn, Queen's Park Institution and Infirmary.—Res. Jun. Asst. M.O. £150.
Bolingbroke Hospital, Wandsworth Common, S.W.—Res. M.O. £200.
Bolton Royal Infirmary.—Consulting Orthopædic Surgeon. £300. Also Asst. Res. Surg. O. for Casualty Dept. £200.
Bootle General Hospital.—Two H.S.'s and Cas. O. Each at rate of £150.
Bradford Children's Hospital.—H.P. £100.
Bury Infirmary, Lancs.—H.S. to Spec. Depts. Also 3rd H.S. At rate of £175 and £150 respectively.
Cambridge, Addenbrooke's Hospital.—Res. Anæsthetist and Emergency Officer. Also H.S.'s. All at rate of £130.
Cardiff, King Edward VII Welsh National Memorial Association. Three Half-time Asst. Tuber. O.'s. Each £250.
Chelmsford and Essex Hospital.—Two Res. M.O.'s. Each £150.
Chester, City and County of.—Asst. M.O.H. and Asst. School M.O. £500.
Chester, East Lancashire Tuberculosis Colony, Barrowmore Hall, Gt. Barrow.—H.P. At rate of £100.
Colchester, Essex County Hospital.—Asst. H.S. £120.
Derby, Derbyshire Hospital for Women, Friar Gate.—H.S. At rate of £150.
Dreadnought Hospital, Greenwich.—H.P. and H.S. Each at rate of £110.
East Ham Memorial Hospital, Shrewsbury-road, E.—H.P. At rate of £150. Also H.S. to Spec. Depts. and Cas. O. Each at rate of £120.
Essex County Council.—Asst. County M.O. and Asst. M.O.H. £700.
General Lying-in Hospital, York-road, Lambeth, S.E.—Jun. Res. M.O. and Anæsthetist. At rate of £100.
Glasgow Royal Mental Hospital, Gartnavel.—Res. Asst. P. £300.
Gloucester, Gloucestershire Royal Infirmary, &c.—Hon. Asst. Ophth. Surgeon.
Guy's Hospital Medical School, S.E.—Astley Cooper Studentship. £150.
Hôpital Français, 172, Shaftesbury-avenue, W.C.—Jun. Res. M.O. £100.
Hospital for Tropical Diseases, Endsleigh-gardens, W.C.—Two H.P.'s. Each at rate of £110.
Hull Royal Infirmary.—H.S. to Parent Institution. Also H.S. to Sutton Branch Hospital. At rate of £150 and £160 respectively.
Inverness, Royal Northern Infirmary.—H.P. At rate of £100.
Leeds Public Dispensary.—Sen. Res. M.O. £200.
Leicester Royal Infirmary.—Surgical Dressers. 10s. 6d. a week. Also Two House Surgeoncies. Each £125.
Liverpool, Mill-road Infirmary.—Res. Asst. M.O. £200.
Liverpool Royal Children's Hospital.—Res. Cas. O. £250.
Liverpool Royal Southern Hospital.—H.S. Also M.O. to Special Depts. and Res. Anæsthetist. Each at rate of £60.
London Lock Hospital, 283, Harrow-road, W.—Res. M.O. At rate of £175.
Macclesfield General Infirmary.—Second H.S. At rate of £150.
Manchester, Ancoats Hospital.—Two H.S.'s. Each at rate of £100.
Miller General Hospital, Greenwich-road, S.E.—Res. Surg. O. and Reg. Also H.P. £250 and £100 respectively.
Norwich, Norfolk and Norwich Hospital.—H.S. £120.
Nottingham Children's Hospital.—Res. H.S. At rate of £150.
Nottingham General Hospital,—H.P. At rate of £150.
Plaistow Fever Hospital, E.—Jun. Asst. M.O. £300.
Poole, Dorset, Cornelia and East Dorset Hospital.—Hon. Physicians.
Preston and County of Lancaster Royal Infirmary.—H.S. to Special Depts. At rate of £150.
Prince of Wales's General Hospital, Tottenham, N.—Sen. and Jun. H.P.'s. At rate of £120 and £90 respectively.
Queen's Hospital for Children, Hackney-road, E.—H.P. and Cas. O. Each at rate of £100.
Richmond Royal Hospital, Surrey.—Hon. Surgeon to Ear, Nose, and Throat Dept. Also Sen. and Jun. H.S. At rate of £150 and £100 respectively.
Rotherham Hospital.—Sen. H.S. £200.
Royal Free Hospital, Gray's Inn-road, W.C.—Asst. M.O. for V.D. Dept. £350.
St. John's Hospital, Lewisham, S.E.—H.S. At rate of £100.
St. Leonards-on-Sea, Buchanan Hospital.—Sen. and Jun. H.S. At rate of £175 and £125 respectively.
Salisbury General Infirmary.—H.S. and H.P. Each at rate o £150.
Sheffield, Jessop Hospital for Women, Norton.—Res. M.O. £150.
Sheffield Royal Infirmary.—H.S. and Asst. Aural and Ophth. H.S. Each at rate of £80.
Swanley, Hospital Convalescent Home, Parkwood.—Res. M.O. At rate of £200.
Swansea and Merthyr Tydfil Joint Mental Hospital.—Deputy Med. Supt. £525. Asst. M.O. £350. H.P. £100. And Two Clin. Assts.
Torquay, Torbay Hospital.—H.P. £175.
Walsall, Manor Hospital.—Jun. Res. Asst. M.O. £150.
West London Hospital, Hammersmith-road, W.—H.P., Three H.S.'s, and Res. Anæsthetist. Each at rate of £100.
Wigan, Royal Albert Edward Infirmary and Dispensary.—Two H.S.'s. Each at rate of £150.
Wolverhampton, New Cross Hospital.—Res. Asst. M.O. £200.
Wolverhampton, Royal Hospital.—H.S. Also H.S. to Ear, Nose and Throat Dept. Each at rate of £100.

Births, Marriages, and Deaths

BIRTHS

OGILVIE.—On August 10th, at 17, Brandling Park, Newcastle-on-Tyne, to Grace, wife of Alan Gordon Ogilvie, M.R.C.P.—a daughter.

PEEBLES.—On August 15th, at Gloucester-court, Kew, the wife of W. Peebles, L.D.S. R.C.S. Eng., of a son.

WILSON.—On August 8th, the wife of St. George Wilson, F.R.C.S., Rodney-street, Liverpool, of a daughter.

MARRIAGES

KETTLE—BALL.—On August 10th, at All Saints, Southbourne, Bournemouth, Austin Braybrooke Kettle, M.D., M.R.C.P., to Margaret Doris, second daughter of the late Mr. H. G. and Mrs. Ball, of Southbourne, Bournemouth.

DEATHS

EDWARD.—On August 10th, at Queen's-crescent, Edinburgh, Alexander Airth Edward, M.D., late of Rawtenstall, Lancs.

JOHNSTON.—On August 13th, at Calder Bridge, Cumberland, after a short illness, Colonel Percy Herbert Johnston, C.M.G., late R.A.M.C., of Chester-terrace, S.W., aged 81.

MORITZ.—On August 9th, at The Hornbeam, Rusholme, Manchester, Siegmund Moritz, M.D., M.R.C.P., M.Sc., in his 78th year.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.